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A SURVEY OF COMPOUNDS FOR RADIATION PROTECTION

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SCHOOL OF AEROSPACE MEDICINE
USAF AEROSPACE MEDICAL DIVISION (AFSC)
BROOKS AIR FORCE BASE, TEXAS

A SURVEY OF COMPOUNDS FOR RADIATION PROTECTION

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A SURVEY OF COMPOUNDS FOR RADIATION PROTECTION

INTRODUCTION

The purpose of the radiation screening program of the University of Chicago USAF Radiation Laboratory is to find chemical or biologic agents which exhibit prophylactic or therapeutic effectiveness against radiation injury. Testing the ability of such agents to prolong survival or to reduce lethality in x-irradiated mice is one phase of our efforts to find practical methods to modify radiation injury in animals. Other phases of the program include: (1) the investigation of the physiologic and biochemical mechanisms responsible for the toxic and protective effects of radioprotective agents in mice and other species; (2) the evaluation of the efficacy of such agents against chronic radiation exposure and against exposure to other types of ionizing radiation; and (3) the ability of various environmental and pharmacologic factors to modify either the toxic or the protective properties of single agents or of combinations of radioprotective agents.

The present report summarizes the results that were obtained with approximately 1,200 compounds tested before 1 January 1961. It has a twofold purpose: (1) to facilitate the comparison of chemically related groups for structure-activity relationships and (2) to indicate the types of structures which offer the greatest promise as a source of more effective and less toxic radioprotective agents. As relatively few radioprotective agents were available at the time these studies were initiated, the compounds used in the testing program

were selected with the idea of obtaining examples of as many different chemical types as possible. Since more information has been accumulated on potentially radioprotective agents of a rather large number of chemical types, it is now possible to depend less on the survey approach of selection and more on trying to obtain compounds designed to provide more specific data on the structure-activity relationships within each chemical type. Therefore, the logical outcome of this approach would be to increase ability in predicting whether a compound would exert radioprotective effects on the basis of its chemical structure. The survey, or nondirective, type of selection cannot be completely abandoned, however, because the radioprotective effect of a compound often appears to represent a unique property of the particular compound which is not exhibited by closely related derivatives.

EXPERIMENTAL METHODS

Adult male mice (6 to 8 weeks old) from the Carworth Farms (CF₁) were used in the studies. The average weight was from 20 to 25 gm. The mice were housed, 10 mice to the cage, in an air-conditioned room (75° to 80° F.), and were provided with Rockland mouse pellets and water ad libitum. Both control and treated animals were selected at random from a single shipment so that their age and physical condition would be comparable. All the mice were kept under observation for at least one week before they were used. Those that appeared to be unhealthy or failed to gain weight at a normal rate were removed for autopsy.

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To evaluate the radioprotective activity of the compounds, the mice were divided into group of 10 and injected intraperitoneally. Ten to 15 minutes after the injection, they were exposed to 800 r of whole-body x-radiation. Each compound was tested for protective effects at two dosage levels or more, one of which was near the maximum tolerated dosage level for the particular compound. Distilled water was used as the vehicle whenever possible and the concentration of the injection solutions was adjusted so that no animal received more than 2 percent of its body weight with each injection. When it became necessary, the pH of the injection solution was adjusted to approximately 7.0 with dilute HCl or NaOH. Compounds which were insoluble in water, or in mixtures of water and propylene glycol, were either dissolved in cottonseed oil or suspended in a 0.5 percent solution of carboxymethylcellulose. Control animals were injected with equivalent quantities of the vehicle used to prepare the injection solution and were irradiated simultaneously with the treated groups. The loss of weight and the mortality of the control groups and the treated irradiated groups were observed daily for 30 days after the x-ray exposure, or until all the mice in the treated groups were dead.

The radiation exposures were given as single whole-body exposures of 250 kvp, 15 ma. x-ray by means of either a G. E. Maximar or a Keleket x-ray therapy unit. The added filtration consisted of 0.25 mm. of copper and 1.0 mm. of aluminum, and the target-skin distance was 75 cm. The dose rate in air was determined before each radiation period by using Victoreen ionization thimbles (100 r) and was found to be between 40 and 43 r per minute during the entire period of these studies. The animals were irradiated in individual plastic tubes (50 ml. centrifuge tubes provided with numerous air holes). The tubes were placed radially on a rotating turntable so that each animal would receive an equal radiation exposure. The mice were irradiated in groups of 16, and control mice (vehicle only) were included with each group of 10 treated mice. The environmental temperature was maintained at 75° F. during the irradiation

period to minimize the effect of variations in the environmental stress in both the control and the treated groups.

RESULTS

Preliminary toxicity studies were made of each compound before the tests were made for radioprotective activity. These studies were necessary to determine the amount of each compound the mice could receive before the chemical toxicity caused death. For the studies small groups of mice were injected intraperitoneally with increasing dosage levels of each compound, and the resulting mortality was recorded for one week. The approximate LD₅₀ (7-day) thus obtained was used as the basis for selecting the dosage levels to be used in the radiation studies.

Doses of the compounds larger than 1,000 mg./kg. are usually impractical in studies of radiation protection because of the size of the sample dose and because of the disadvantages of injecting increased amounts of the vehicle. Therefore, compounds which did not produce mortality when given in doses of 1,000 mg./kg. were not tested at higher dosage levels. The approximate LD₅₀ in milligrams per kilogram for each of the compounds tested is included in the tables which comprise the remaining part of this report. It can be seen that the dosage levels used for the studies in radiation protection are frequently lower than might be anticipated on the basis of results of the toxicity studies. As the mice were confined in rather tight-fitting tubes during the radiation exposure, and as the compounds produced a severe depression, the radiation exposure in the studies caused early mortality. Therefore, it was necessary to reduce the dosage level to less than the apparent maximum that otherwise might be tolerated.

The x-ray dosage level uniformly caused a mortality of nearly 100 percent within a period of 2 weeks under our experimental conditions. Radiation deaths usually began on the fifth or sixth day after the x-ray exposure and the

median survival time (ST_{50}) of untreated animals was 9 ± 3 days. A compound is considered to exhibit radioprotective activity if it increases the median survival time (ST_{50}) by 5 days or more, or if it permits any of the treated animals to survive for 30 days after the x-ray exposure.

Of the compounds included in this report 211 exhibited radioprotective activity by these criteria. About 40 of the 211 radioprotective compounds permitted half or more of the irradiated mice to survive for 30 days after the lethal x-ray exposure. Although most of the protective compounds are related to previously known radioprotective agents, several new types of chemical configurations have been demonstrated to show radioprotective activity. Moreover, a sufficient number of compounds has been tested to permit preliminary structure-activity correlations to be made within a number of the different types of chemical structures.

Since all these studies were carried out by using a single dose of x-radiation (800 r), the results do not provide a precise quantitation of the radioprotective effects of each compound tested. The protective effect, however, or dose-reduction factor (DRF), resulting from the preirradiation administration of a compound can be estimated on the basis of the x-ray dosage level which would be required to pro-

TABLE I
Estimated dose-reduction factors based on 30-day mortality data

Percent of treated animals surviving at 30 days after the 800 r x-ray exposure	Administered radiation dose divided by the effective radiation dose (DRF)
10 to 20	1.3
30 to 40	1.4
50 to 60	1.5
70 to 80	1.6
90 to 100	1.7

duce a comparable mortality at 30 days after the irradiation exposure. The LD_{50} (30-day) value for acute whole-body x-ray exposure in adult CF₁ male mice is 542 ± 18 r under our experimental conditions, and the estimated DRF values are given in table I.

In the tables which comprise the remaining part of the report the compounds are listed in order of increasing complexity within each of the chemical types. The name and code designation of each compound is listed with the vehicle used. In the radiation studies the change in ST_{50} indicates the increase or decrease (in days) of the median survival time of the treated animals when compared to that of simultaneously irradiated control (vehicle only) groups.

ALCOHOLS

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
2-Aminoethanol EK-1597 (PG)	50-100	50 25	-3 +2	10/10 8/10
2-Methylaminoethanol DO-50 (H ₂ O)	125-250	100 50	0 -3	10/10 10/10
t-Butylaminoethanol RH-2 (H ₂ O)	>1,000	1,000 500	+4 -4	10/10 10/10
Iothionic acid DO-14 (H ₂ O)	50-100	25 10	-1 -4	10/10 10/10
2-Dimethylamino-2-methyl-1-propanol CS-1 (H ₂ O)	25-50	25 10	-1 -6	10/10 10/10
2,3-Dibromo-1-propanol DO-42 (PG)	125-250	100 50	+1 -2	10/10 10/10
2-Chloro-2-nitro-1-butanol CS-257 (PG)	200-300	200 100	0 -2	10/10 10/10
1-Amino-2-pentanol CS-3 (H ₂ O)	100-200	100 50	-1 -1	10/10 10/10
2,2'-(Methyl imino) diethanol DO-52 (H ₂ O)	500-1,000	500 300	-1 0	10/10 10/10
2-Amino-3-hexanol CS-2 (H ₂ O)	50-100	50 25	-1 +2	10/10 10/10
4-Amino-2-methyl-3-hexanol CS-4 (H ₂ O)	25-50	25 10	-2 +2	10/10 10/10
2-Amino-2-methyl-3-hexanol CS-5 (H ₂ O)	300-500	300 100	+2 +3	10/10 10/10
2-Allyloxyethanol DO-47 (PG)	250-500	250 100	-1 0	10/10 10/10
2-Chloro-2-nitro-3-nonanol CS-1295 (PG)	50-100	50 25	0 0	10/10 10/10
d-N-(Pantoyletauryl) amino-octadecane SN-5 (CMC)	1,000	1,000 200	-3 1	10/10 10/10
Cyclohexane methanol DO-49 (PG)	250-500	250 100	-5 0	10/10 10/10

(ALCOHOLS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
1-Cyclohexylamino-2-propanol DO-19 (H ₂ O)	100-200	100 50	-2 -5	10/10 10/10
4-Tert-butyl cyclohexanol (Padaryl) DO-20 (PG)	50-100	50 25	-2 -4	10/10 10/10
3-Dimethylamino-1-phenyl-1-propanol EL-80 (H ₂ O and PG)	200-300	200 100	-2 -2	10/10 10/10
2-Amino-1-phenyl-1-propanol CS-6 (H ₂ O)	200-300	100 50	-4 0	10/10 10/10
2-Amino-1-phenyl-1-propanol CS-7 (H ₂ O)	100-200	100 50	+2 +1	9/10 10/10
2-Amino-2-methyl-1-phenyl-1-propanol CS-8 (H ₂ O)	25-50	25 10	0 +2	10/10 10/10
N-Isopropyl-2-hydroxy-2-(o-chloro-phenyl) ethylamine hydrochloride EL-50 (H ₂ O)	100-200	100 25	+2 -1	10/10 10/10
2-p-Chlorophenyl-3-methylbutane-2,3-diol EL-44 (PG)	200-300	200 100	0 +1	10/10 10/10
2-Bromo-2-nitro-1-phenyl-1-ethanol CS-1301 (PG)	25-50	25 10	--9 +1	10/10 10/10
α-Dl-Propoxyphene carbinol EL-84 (PG)	100-200	100 50	+1 +4	10/10 10/10
3-n-Pentadecyl catechol UCTL-1803 (H ₂ O and HCl)	50-100	75 50 10	-3 -1 +4	10/10 10/10 10/10
4-Nitro-3-trifluoromethylphenol MA-6 (PG)	25-50	25 10	+2 +2	10/10 10/10
2-Chloro-4,6-dinitrophenol DO-60 (PG)	125-250	25 10	-3 +2	10/10 10/10
Octyl phenol RH-6 (PG)	25-50	25 10	-	10/10 10/10

(ALCOHOLS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
3,4-Dihydroxy-phenethylamine hydrobromide EL-47 (H ₂ O)	500-1,000	750	-3	8/10
		500	+3	10/10
		300	+2	10/10
3-Hydroxytyramine CB-9 (H ₂ O)	>1,000	1,000	-3	7/10
		500	0	10/10
5-Hydroxytryptamine CB-32 (H ₂ O)	>300	200	+5	8/10
		100	+3	7/10
		90	>+18	2/10
		75	>+19	4/10
		50	+2	8/10
		25	+3	7/10
Tetrachlorohydroquinone DO-62 (PG)	25-50	10	-2	10/10
		5	0	10/10
Orthophenylphenol EK-2219 (PG and H ₂ O)	50-100	50	-2	10/10
		20	-3	10/10
		10	+1	10/10
p-p'-Biphenol DO-30 (PG)	100-200	100	+1	10/10
		50	+1	9/10
N,N'-Ethylene diimino di (o-cresol) DO-63 (PG)	100-200	100	+1	10/10
		50	+1	10/10
2,2'-Methylene bis-(4-ethyl-6-tertiary)-butyl phenol CY-6 (PG)	50-100	50	-2	10/10
		25	-1	10/10
2,5-Di-tert-amylhydroquinone B-21 (CMC)	200-300	200	-2	10/10
		100	-7	10/10
Gallic acid EK-T-142 (H ₂ O)	>1,000	1,000	-4	10/10
		400	-1	10/10
5-(p-Acetamidophenylazo)-8-quinolinol hydrochloride EK-5313 (PG)	200-300	200	-4	10/10
		100	+2	10/10

THIOLS

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Ethanethiol EK-958 (PG and H ₂ O)	>300	500 250	+4 +1	8/10 10/10
2-Mercaptoethanol EK-4196 (PG and H ₂ O)	200-300	200 100	+3 0	9/10 8/10
Mercaptoethylamine hydrochloride EE-3 (H ₂ O)	425	300 250 225 200	+5 -7 >+21 >+21	6/10 5/10 3/10 4/10
Diethylaminoethanethiol hydrochloride E-4 (H ₂ O)	100-200	100 50	+2 +1	10/10 10/10
2-(Di- <i>n</i> -propylamino)-ethane thiol A-16784 (PG)	5-10	5 1	-1 -3	10/10 10/10
Mercaptoneetic acid (sodium salt) EK-5199 (H ₂ O)	200-300	200 100 50	-6 +1 -3	10/10 10/10 10/10
Methyl mercaptoacetate EK-7119 (H ₂ O)	100-200	100 25	+3 +2	10/10 10/10
Ammonium thioglycolate MO-2 (H ₂ O)	100-200	100 50	0 -4	10/10 10/10
1-Thioglycerol B-40 (PG)	200-300	200 50	+18 -1	4/10 10/10
Dithioglycerol, 2,3-dimercapto-propanol (BAL) ME-1 (PG)	25-50	25 10	+1 +1	8/10 10/10
Mercaptopropionic acid E-5 (H ₂ O)	10-25	20 10	+2 0	10/10 10/10
Cysteine methyl ester A-18334 (H ₂ O)	>1,000	1,000 500	-2 0	10/10 10/10
dl-Homocysteine (free base) B-12 (H ₂ O)	500-1,000	500 200 100	+3 -1 -1	10/10 10/10 10/10
Penicillamine hydrochloride A-1705; EL-23 (H ₂ O)	1,000 (A-1705) 200-300 (EL-23)	500 200 200 100	-1 0 -4 +1	10/10 10/10 10/10 10/10

(THIOLS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Mercaptosuccinic acid EK-P-6297; M-2 (H ₂ O)	300-500 (M-2)	300 100	-6 -2	10/10 10/10
	200-300 (EK-6297)	200 100	-1 -2	10/10 10/10
Diisopropyl thiomalate ND-62 (PG)	100-200	100 50	-3 0	10/10 10/10
Dimethyl thiomalate ND-61 (PG)	50-100	50 25	-2 -1	10/10 10/10
Dilauryl thiomalate ND-63 (PG)	100-200	100 50	0 +1	9/10 10/10
1-Thiosorbitol P-1 (H ₂ O)	>2,000	1,000 500	+4 +1	9/10 10/10
Dithiodiglycol TH-9 (PG)	100-200	200 100	-2 0	10/10 10/10
dl-Dihydro-α-6-thioctic acid XR-12 (H ₂ O and NaOH)	100-200	150	+1	10/10
		100	-1	10/10
		50	-2	10/10
		25	0	10/10
1-Hexanethiol EK-4628 (PG and H ₂ O)	200-300	200 100	+1 +3	10/10 10/10
1-Heptanethiol EK-2122 (PG and H ₂ O)	200-300	200 100	+1 0	10/10 10/10
Iso-octylthioglycolate MO-5 (H ₂ O)	>1,000	1,000 500	-3 +1	10/10 10/10
Furfuryl mercaptan B-58 (PG)	100-200	100 50	-2 0	10/10 8/10
1,6-Hexane dithiol UCTL-72 (PG and H ₂ O)	100	100 50	-3 +2	10/10 10/10
Keryl mercaptan B-3 (Cottonseed oil)	>2,000	2,000 1,000	0 -1	10/10 10/10
Thiogel-thiolated gelatine S-4 (H ₂ O)	>1,000	1,000 500	+3 -1	10/10 10/10
α-Toluenethiol EK-1509 (PG and H ₂ O)	100-200	100 50	+4 +3	9/10 10/10

(THIOLS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
p-Xylyl-2-thioglycolic acid B-2 (PG and H ₂ O)	300-400	200 50	-5 +2	10/10 10/10
<i>a</i> -Mercaptoacetanilide EK-6583 (CMC)	200-300	300	+5	8/10
		250	+3	10/10
		200	+3	9/10
		150	>20	10/10
		100	+2	10/10
N-(o-Tolyl) mercaptoacetamide UCTL-1768 (H ₂ O)	100-200	50 30	+4 +4	10/10 10/10
<i>a</i> -Mercapto-N-2-naphthyl-acetamide EK-5828 (CMC)	>300	400	-3	10/10
		200	+1	10/10
		100	0	10/10
3,5-Diiodo-4-pyridine thioglycolic acid XR-24 (H ₂ O and NaOH)	>100	150 100	+3 +1	10/10 10/10
Benzenethiol XR-19 (H ₂ O and NaOH)	25-50	25	-2	10/10
		20	-3	10/10
		5	-3	10/10
p-Toluenethiol EK-510 (CMC)	200-400	200	0	10/10
		100	+3	10/10
<i>o</i> -Toluenethiol EK-2676 (PG and H ₂ O)	100-200	100	-5	10/10
		50	+4	10/10
<i>m</i> -Toluenethiol EK-2680 (PG and H ₂ O)	50-100	75	-4	10/10
		50	+1	10/10
2-Aminobenzenethiol hydrochloride XR-17 (H ₂ O)	100-150	100	+3	10/10
		50	+3	10/10
		25	-1	10/10
<i>o</i> -Aminobenzenethiol EK-4376 (CMC)	25-50	20	+2	10/10
		10	-1	10/10
Monothiohydroquinone B-57 (PG)	100-200	100	+1	7/10
		50	0	10/10
		100	-4	10/10
		100	0	10/10
		50	+1	10/10
		50	+5	10/10
Thiosalicylic acid (<i>o</i> -Mercaptobenzoic acid) EK-T-2805 (H ₂ O and NaOH) XR-35 (H ₂ O and NaOH); KF-2 (PG)	50-200	50	-1	10/10
		25	+1	10/10
Methyl- <i>o</i> -mercaptobenzoate MA-15 (PG)	50-100	50	-1	10/10
		25	+1	10/10

(THIOLS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
p-Mercaptobenzene sulfonamide LO-1 (PG)	200	200		-2
		100		+2
		50		+1
2-Amino-4-iodo benzenethiol XR-18 (H₂O and NaOH)	>150	150		-3
		100		+1
		50		-1
Pentachlorothiophenol B-51 (PG)	100-200	100		+6
		50		+3
3,5-Dibromo-4-pyridinethiol XR-25 (H₂O and NaOH)	100	150		+3
		100		+1
3,5-Diiodo-4-pyridinethiol XR-23 (PG)	100	100		-2
		50		+2
2-Naphthylenethiol CY-4 (PG); M-1	200-300	200		0
		100		-3
		50		0
		50		-1
Dithiol B-59 (PG)	50-100	50		-4
		20		+4
Zinc salt of 3-amino-4-mercaptopbenzotrifluoride MA-7 (PG)	100-200	100		+1
		50		+2

ETHERS and THIOETHERS

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
3-Methyl-3-(mercaptomethyl) oxetane (polymer of) PD-13 (PG)	200-300	200 100	-2 -4	10/10 10/10
Allyl phenyl ether DO-23 (PG)	100-200	100 50	-6 -4	10/10 10/10
4-Phenoxy-N-butylamine hydrochloride EL-12 (H ₂ O)	100-200	100 50	0 0	10/10 10/10
Hydroquinone dimethyl ether UCTL-1791 (PG and H ₂ O)	100-200	150 100	+2 +1	10/10 10/10
Bis-(p-bromophenyl) ether DO-61 (PG)	125-250	100 50	-1 +2	10/10 10/10
4-Amino-2'-ethoxy diphenylamine-2-sulfonic acid ND-64 (H ₂ O)	>1,000	500 200	-1 -5	10/10 10/10
2,2'-Thiodiethanol EK-T-1224; B-6 (PG and H ₂ O)	>1,500	1,500 1,000 750 500	+4 +3 0 +2	10/10 10/10 10/10 10/10
1,2-Bis(2-bromoethylthio)ethane UCTL-904 (H ₂ O)	100	75 50	-3 -2	10/10 10/10
Thiodiglycolic acid E-2 (H ₂ O)	300-500	300 200	-5 -4	10/10 10/10
Ethylmercapto acetic acid EK-2070 (PG and H ₂ O)	100-200	100 50	-1 +1	10/10 10/10
S-2-Aminoethyl-homocysteine monohydrochloride B-4 (H ₂ O)	1,000-1,500	1,000 500	-1 -1	10/10 10/10
S-Ethyl cysteine AB-3 (H ₂ O)	>300	100	+1	10/10
2-Amino-ethyl-cysteine mono-hydrochloride XR-43; B-5 (H ₂ O)	>2,000 (B-5)	2,000 1,500 1,000 300-400 (XR-43)	-3 >19 4 2 -3 -1	8/10 3/10 10/10 10/10 10/10 10/10

(ETHERS and THIOETHERS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
S-2-Aminoethyl-cysteine dihydrochloride B-9 (H ₂ O)	200-400	200 100	+2 -7	10/10 10/10
S-Benzyl cysteine AB-1 (H ₂ O)	>250	100	0	10/10
dl- α -5-Thioctic acid XR-13 (H ₂ O)	>150	150 100 50 25	0 -1 -2 -2	10/10 10/10 10/10 10/10
dl- α -6-Thioctic acid XR-11 (H ₂ O)	>100	150 (i.v.) 100 50 25	0 -1 -4 -4	10/10 10/10 10/10 10/10
dl-8-Methyl- α -6-thioctic acid XR-14 (H ₂ O)	>100	150 (i.v.) 100 50 25	+3 0 -1 -2	10/10 10/10 10/10 10/10
2-Amino-4,4'-dichlorodiphenyl sulfide AB-21 (PG and H ₂ O)	>200	250 200 100	0 +5 +1	10/10 10/10 10/10
2,2'-Diamino-5,5'-dichlorophenyl sulfide hydrochloride hydrate AB-84 (H ₂ O)	200-400	300 200	-6 +1	10/10 10/10
N,N-Diethyl, 2(o-acetamido-phenylthio) ethylamine methiodide A-12634 (PG)	25-50	50	+1	10/10
1,4-Bis(dimethylamine) 2-(phenylthio)-2-butene A-3939 (PG)	100-200	100	+3	10/10
N,N'-Dimethyl- γ -(phenylthio)-allylamine A-4720 (PG)	100-200	100	0	10/10
N,N'-Dimethyl- γ -(p-tolylthio)-allylamine A-4719 (PG)	200	100	+1	10/10
N,N'-Dimethyl- γ -(n-dodecylthio)-allylamine A-4718 (PG)	200	100	+2	10/10
β -(Benzylthio) ethylamine hydrochloride A-2341 (H ₂ O)	100-200	100	0	10/10

(ETHERS and THIOETHERS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
2-Amino-2'-chlorodiphenyl sulfide AB-16 (PG and H ₂ O)	>200	300		+5
		150		+4
		100		+2
N,N-Dimethyl, β (p-chlorophenylthio)-n-propylamine hydrochloride A-12637 (H ₂ O)	200-300		200	+1
N,N-Diethyl, β (o-chlorophenylthio) ethylamine A-12633 (H ₂ O)	100-200	100		+1
		25		-1
N,N-Diethyl, β (o-tolylthio) ethylamine A-12632 (PG)	50-100		50	0
N,N-Diethyl, β (p-tolylthio) ethylamine hydrochloride A-12630 (H ₂ O)	200		100	-2
N,N-Diethyl, β (p-chlorophenylthio) ethylamine hydrochloride A-12621 (H ₂ O)	100		150	-1
N,N-Dimethyl, β (o-anisylthio)-n-propylamine hydrochloride A-12618 (H ₂ O)	100-200	100		+2
		25		-1
N,N-Diethyl, β (o-anisylthio)ethylamine hydrochloride A-12616 (H ₂ O)	100-200		100	-2
N,N-Diethyl, β (p-acetamido-phenylthio) ethylamine methiodide A-12627 (H ₂ O)	10-25		10	+1
N,N-Dimethyl, β (m-anisylthio)-n-propylamine hydrochloride A-12638 (H ₂ O)	200-300		50	-2
			20	3
N,N-Diethyl, β (p-anisylthio)ethylamine hydrochloride A-12640 (H ₂ O)	100-200	100		0
		50		-3
N,N-Dimethyl, γ (p-tolylthio)-allylamine A-5025 (PG)	100-200		100	+1
N,N-Diethyl-[3-(phthalimido)-n-propylthio] ethylamine A-2369 (H ₂ O)	50-100	50		+1
		20		0

(ETHERS and THIOETHERS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
2-(N,N-Dimethylaminopropyl)-4,4'-dichlorodiphenyl sulfide hydrochloride AB-373 (H ₂ O)	100-150		150 130 50	-5 -3 -1	10/10 10/10 10/10
2-(N,N-Dimethylpropylamino)-4',5-dichlorodiphenyl sulfide hydrochloride AB-74 (H ₂ O)	50-100		75 50	-3 0	10/10 10/10
4,4'-Thiobis-(6-tert-butyl-m-cresol) B-15 (CMC)	50-100		50 25	-7 -2	10/10 10/10
2,2'-Thiobis(4,6-dichlorophenol) B-22 (CMC)	100-200		100 50 20	-5 -6 0	10/10 10/10 10/10
Diphenyl disulfide E-1 (PG)	100-200		100 50	-5 -1	10/10 10/10
2-Acetamido-4'-chlorodiphenyl sulfide AB-19 (PG and H ₂ O)	>400		300 200	+3 +4	10/10 10/10
2-(3-Dimethylaminopropionamide)-4',5-dichlorodiphenyl sulfide AB-68 (PG and H ₂ O)	100-200		200 100 50	-5 9 0	10/10 10/10 10/10
(Bis)-2-acrylamido-4-chlorophenyl sulfide AB-85 (H ₂ O)	>400		250 200	0 -2	10/10 10/10
2-Amino-3,4'-dichlorodiphenyl sulfide hydrochloride AB-67 (H ₂ O)	>400		300 200	-4 0	10/10 10/10
Bis-(2-amino-2-phenylethyl) disulfide dihydrochloride XR-34 (H ₂ O)	50-100		100 75	-2 0	10/10 10/10
Bis-(2-aminophenyl) disulfide AB-315 (PG and H ₂ O)	50-100		75 50 25	+3 +3 +3	10/10 8/10 10/10
Bis-(2-nitro-4-trifluoromethyl phenyl) disulfide MA-9 (PG)	50-100		50 25	0 +2	10/10 10/10

ALDEHYDES and OXIMES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD_{50} in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Acetaldehyde oxime AM-5 (PG)	100-200	100 50	+2 0	10/10 10/10
Trimethoxy ethoxy propane KF-24 (H ₂ O)	>1,000	500 300	+2 -1	10/10 10/10
Tetra ethoxy propane KF-26 (PG)	200-300	200 100	-1 -2	10/10 10/10
n-Butyraldehyde oxime AM-6 (PG)	200-300	200 100	+1 -1	10/10 10/10
Isobutyraldehyde oxime AM-8 (PG)	100-200	100 50	0 -2	10/10 10/10
2-Methyl pentaldehyde FO-3 (H ₂ O)	>1,000	1,000 500	-2 -1	10/10 10/10
p-Hydroxybenzaldehyde M-6 (H ₂ O)	500-1,000	500 200	-3 -1	10/10 10/10
o-Chlorobenzaldehyde M-7 (PG)	10-25	10 5	+2 +3	10/10 10/10

KETONES and PHENONES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Acetol DO-45 (PG)	500-1,000	500 300	+1 +1	10/10 10/10
Methyl ethyl ketoxime AM-3 (H ₂ O)	200	100 50	-3 +4	10/10 10/10
Acetone diethyl acetal DO-44 (PG)	125-250	100 50	+1 0	10/10 10/10
Methyl isobutyl ketoxime AM-4 (PG)	200-300	200 100	+1 0	10/10 10/10
Methyl isoamyl ketoxime AM-7 (PG)	100-200	100 50	-1 0	10/10 10/10
Dimethylglyoxime sodium salt B-119 (H ₂ O)	200-300	200 100	-1 -3	10/10 10/10
4-Ethyl-3,5-heptanedione dioxime CS-503 (PG)	200-300	200 100	0 +1	10/10 10/10
Oleoyl acetone DO-9 (PG)	200-300	200 100	+2 +4	10/10 8/10
1-(Dibenzylamino)-2,3-butane-dione-2-oxime IN-7 (H ₂ O)	300-400	300 100	-2 0	10/10 10/10
Hexachloro-2,5-cyclohexadien-1-one DO-65 (PG)	50-100	10 5	+1 +1	10/10 10/10
Acetophenone EK-49G (PG)	200-300	200 50 25	--5 -1 +3	10/10 10/10 9/10
o-Hydroxyacetophenone KF-20 (PG)	100-200	100 50	+2 +2	9/10 10/10
p-Hydroxyacetophenone KF-15 (PG)	200-300	200 100	-4 -2	10/10 10/10
4-Chloroacetophenone DO-1 (PG)	100-200	100 50	+3 +1	10/10 8/10
m-Nitroacetophenone MA-1 (PG)	200-300	200 100	-3 -0	10/10 10/10

(KETONES and PHENONES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
α -Chloro-m-nitro-aceto-phenone MA-8 (PG)	50-100	10 5	+1 -3	10/10 10/10
m-Aminoacetophenone EK-P-3598 (H ₂ O)	>1,000	1,000 800 400 200	+2 +2 +3 0	10/10 10/10 9/10 10/10
p-Aminoacetophenone EK-631 (H ₂ O)	300-400	300 200 100 50	+3 +2 +4 -2	9/10 7/10 8/10 10/10
α -Chloro-o-cyano acetophenone UCTL-668 (H ₂ O)	10-20	10 5 1	-4 -2 -1	10/10 10/10 10/10
2,6-Dimethoxy-acetophenone K-2801 (PG)	200-400	200 100	-2 +1	10/10 9/10
Propiophenone EK-1235 (PG and H ₂ O)	100-200	150 100 50	+2 0 +2	10/10 10/10 10/10
Paraminopropiophenone (PAPP) UCTL-1856 (PG and H ₂ O)	80-90	90 60 30	-1 +9 +14	9/10 6/10 5/10
p-Chloropropiophenone EK-5296 (PG and H ₂ O)	200-300	200 50	+2 0	10/10 10/10
p-Hydroxypropiophenone EK-3302 (H ₂ O and PG)	200-300	200 100	+1 +3	10/10 10/10
2,4,5-Trihydroxybutyropheneone EK- (PG)	200	100 50	+2 0	10/10 10/10
p-Acetylamino-N-dimethylamino-propiophenone hydrochloride EL-17 (H ₂ O)	>200	100	+1	10/10
Phenyl cyclohexyl ketone KF-3 (PG)	200-300	200 100	-1 +3	10/10 10/10
Benzophenone EK-346 (CMC)	>600	600 400 200	-2 +2 -2	10/10 10/10 10/10
4-Bromobenzophenone DO-3 (PG)	100-200	100 50	+4 0	10/10 10/10

(KETONES and PHENONES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
p-Aminobenzophenone A-233 (PG)	300	100	+1	8/10
		50	+2	8/10
		25	+1	10/10
4-Methyl benzophenone DO 54 (PG)	250-500	250	-2	10/10
		100	0	10/10
2,4-Dihydroxybenzophenone ND-54 (NaHCO ₃ and H ₂ O) DO-28 (PG)	1,000 100-200	300	+2	10/10
		200	0	10/10
		100	-1	10/10
		50	0	10/10
2-Hydroxy-4-methoxy benzophenone CY-9 (PG)	300-400	300	0	10/10
		100	-1	10/10
4-4'-Dichlorobenzophenone DO-4 (PG)	200-300	200	+6	8/10
		100	0	10/10
2,4'-Benzophenone dикарboxylic acid ND-56 (NaHCO ₃ and H ₂ O)	>1,000	500	0	10/10
		200	-4	10/10
2,2'-Dihydroxy-4-n-octoxy-benzophenone CY-18 (PG)	200	50	0	10/10
		25	+4	10/10
2-Hydroxy-5-phenyl-propiophenone DO-2 (PG)	300	200	+2	10/10
		100	-2	10/10
Dibenzoylethylene ND-57 (PG)	25-50	25	-8	10/10
		10	0	10/10
β -Benzylmethylamino propiophenone hydrochloride EL-85 (H ₂ O)	100-200	100	-1	10/10
		50	+1	10/10
1,4-Naphthoquinone CY-10 (PG)	10-25	5	-4	10/10
		1	+2	10/10
2,3-Dimethyl-1,4-naphthoquinone SN-29 (PG)	100-200	100	-1	10/10
		50	-3	10/10
4,4'-Bis(dimethylamino)-thiobenzophenone EK-6641 (CMC)	>1,000	1,000	-1	10/10
		500	+4	10/10
N,N,N',N'-Tetraethyl-4,4'-diaminobenzophenone ND-58 (PG)	>1,000	500	+1	10/10
		200	0	10/10

(KETONES and PHENONES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
2,5-Bis(phenyl thio)-p-benzoquinone PD-18 (Sesame oil)	100-200	100 50	-3 0	10/10 10/10
4',5,7-Trihydroxy flavonone (Naringin) CF-4 (H ₂ O)	>1,000	1,000 500	+1 -1	10/10 10/10
3,3',4',5,7-Pentahydroxy flavonone Quercetin A-8672 (H ₂ O); CF-1 (H ₂ O)	>1,000	1,000 1,000 500 500	-8 -1 -3 -5	10/10 10/10 10/10 10/10
Quercitrin CF-2 (H ₂ O)	200	100 50	0 -2	10/10 10/10
Quercetin rhamnoglucoside (Rutin) CF-5 (PG)	200-400	200 100 50	-2 +2 +1	10/10 8/10 10/10
2-Ethyl-5,6,7,8-tetrahydro-anthraquinone SO-2 (PG)	200	200 100	-4 +1	10/10 10/10
2-Ethylanthraquinone SO-1 (PG)	200-300	200 100	+3 -2	10/10 10/10
1,8-Dihydroxyanthraquinone ND-59 (PG)	500-1,000	500 200	+1 -3	10/10 10/10
1-Amino-2-sulfo-4(4'-amino-3'-sulfoanilino) anthraquinone ND-60 (PG)	300-600	300 200	-1 +1	8/10 10/10
4-Methyl-1-tetralone-3-carboxylic acid ND-55 (NaHCO ₃ and H ₂ O)	200-300	200 100	-2 -6	10/10 10/10
Quinoxaline 1,4-di-N-oxide H-1 (H ₂ O)	500	400 200	-2 +1	10/10 10/10

ACIDS and THIOACIDS

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Iodoacetic acid sodium salt EK-6279 (H ₂ O)	75	20 10	—4 —1	10/10 10/10
Thiolacetic acid EK-P-737 (PG and H ₂ O)	75	100 50	—4 +3	10/10 10/10
Acetylmercaptoacetic acid EK-P-5430 (H ₂ O)	150	50 25	+1 +2	10/10 10/10
Propionohydroxamic acid CS-502 (H ₂ O)	500	300 200	—3 —2	10/10 10/10
Malonic acid EK-695 (H ₂ O)	300	100 50	—2 —2	10/10 10/10
Sodium pyruvate NB-7 (H ₂ O)	>2,000	1,000 400	—1 —1	10/10 10/10
2-Methylalanine DO-56 (H ₂ O)	>1,000	1,000 500	—1 —2	10/10 10/10
S-Methyl-L-cysteine CB-24 (PG)	500-1,000	500 200	0 —4	10/10 10/10
dl-Isovaline DO-64 (H ₂ O plus heat)	>1,000	1,000 500	—2 +1	10/10 10/10
dl-2-Methyl leucine DO-57 (H ₂ O)	750-1,000	750 500	+1 +1	10/10 10/10
Glycocyamine CB-3 (H ₂ O plus heat)	>1,000	1,000 500	+2 +1	10/10 10/10
Iminodiacetic acid DO-55 (H ₂ O plus heat)	250-500	250 100	0 —2	10/10 10/10
Sodium iminodiacetate monohydrate DO-24 (H ₂ O)	300-500	300 100	—5 —2	10/10 10/10
(2-Hydroxyethyl imino)-dineetic acid DO-37 (PG)	100-200	100 50	—6 —3	10/10 10/10
Cysteine-S-a-propionic acid AB-2 (H ₂ O)	>250	100	0	10/10
Fumaric acid EK-P-583 (H ₂ O)	100-200	100 50	+1 0	10/10 10/10

(ACIDS and THIOACIDS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Methionine sulfoxide NB-4 (H ₂ O)	>1,500	1,000 400	+1 +3	10/10 10/10
dl-Methionine NB-5 (H ₂ O)	>2,000	1,000 400	+1 -3	10/10 10/10
dl-Ethionine NB-6 (H ₂ O)	>1,000	1,000 400	-1 0	10/10 10/10
N-(Chloroacetyl) methionine PD-19 (dilute NaOH)	>300	425 250	+1 +1	10/10 10/10
4,4,4-Trinitrobutyric acid SE-3 (H ₂ O)	100-200	100 50	--1 -3	10/10 10/10
Sebacie acid HC-1 (H ₂ O and PG)	500-1,000	300 100	-6 +2	10/10 10/10
Pantoyl taurine UCTL-4 (H ₂ O)	>800	800 400	0 +3	16/16 16/16
N-Lauroyl amino caproic acid ND-74 (PG)	>200	200 100	--9 -6	10/10 10/10
Benzene boronic acid BO-2 (H ₂ O)	500-1,000	300 100	0 +2	10/10 10/10
O-Iodobenzoic acid (salt) EK-572 (PG and H ₂ O)	200-300	200 100	0 +2	10/10 10/10
p-Chloro-mercuric benzoic acid D-3 (PG and H ₂ O)	25-50	25 10	0 0	10/10 10/10
2-Chloro-4-aminobenzoic acid NB-1 (PG and H ₂ O)	500-750	500 200	--3 +2	10/10 10/10
Benzylmalonic acid XR-36 (H ₂ O)	200-400	200 100	0 +4	10/10 10/10
dl-2-(3,4-Dihydroxyphenyl)-glycine DO-34 (PG)	100-300	100 50	0 +1	9/10 10/10
dl- <i>β</i> -(3,4-Dihydrophenyl)-alanine EL-69 (PG)	>1,000	1,000 500	+2 +3	10/10 10/10

(ACIDS and THIOACIDS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
6-Nitroanthranilic acid AB-382 (H ₂ O plus heat)	>400		200 100	-2 -1	10/10 10/10
3,5-Dichlorosalicylic acid DO-68 (PG)		50-100	50 25	0 +1	10/10 10/10
N-(5-Chloro-2-methoxyphenyl-azo) sarcosine PD-3 (H ₂ O)		200-300	200 100	-4 +3	10/10 10/10
Pyromellitic acid XR-20 (H ₂ O)	300-400		100 150	0 +1	10/10 10/10
3-Phenylsalicylic acid DO-59 (PG)		125-250	100 50	-2 -3	10/10 10/10
4,4'-Biphenyl dicarboxylic acid DO-69 (H ₂ O and NaHCO ₃)		500-1,000	500 300	-2 +2	10/10 10/10

ESTERS and THIOESTERS

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Dimethyl carbonate FO-2 (H ₂ O)	>1,500	1,000 500	+2 -1	10/10 10/10
Triethyl orthoformate KF-23 (H ₂ O)	>1,000	1,000 500	-1 0	10/10 10/10
Glycine ethyl ester hydrochloride DO-10 (H ₂ O)	750-1,000	1,000 500	+2 -1	10/10 10/10
Ethyl propionate EK-125 (PG and H ₂ O)	>1,500	1,000 750	0 +1	10/10 10/10
Methyl-3-chloropropionate DO-7 (PG)	500-750	300 100	+6 -4	10/10 10/10
Tris(propionoxymethyl) nitromethane CS-1744 (PG)	300	200 100	0 +2	10/10 10/10
Isopropyl palmitate KE-5 (PG)	100-200	100 50	0 +3	10/10 10/10
Ethylene glycol monostearate KE-11 (PG)	200-300	200 100	-3 +1	10/10 10/10
Glycerol monostearate KE-7 (PG)	200-300	200 100	--1 --2	10/10 10/10
Diethylene glycol monostearate KE-8 (PG)	200-300	200 100	+2 +3	10/10 10/10
Dimethylaminoethyl methacrylate RH-3 (H ₂ O)	25-50	25 10	+3 0	10/10 10/10
Ethyl allyl acetoacetate FO-6 (H ₂ O)	>1,000	1,000 500	+1 -3	10/10 10/10
Diethyl acetamidomalonate DO-8 (H ₂ O)	>1,000	1,000 500	+1 0	10/10 9/10
Diethyl (mono) propargyl malonate KF-9 (PG)	100-200	100 50	-1 +1	10/10 10/10
Propylene glycol monostearate KE-13 (PG)	200-300	200 100	0 +1	10/10 10/10
Di-2-ethylhexyl isobutyrate KE-2 (PG)	200-300	200 100	+2 +3	10/10 10/10

(ESTERS and THIOESTERS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Isooctyl palmitate KE-1 (PG)	200-300	200 100	+1 +1	10/10 10/10
Polyethylene glycol monostearate #200 KE-12 (PG)	200-300	200 100	0 -1	10/10 10/10
Polyethylene glycol monostearate #1000 KE-9 (PG)	200-300	200 100	-2 +3	10/10 10/10
Polyethylene glycol monostearate #6000 KE-14 (PG)	200-300	200 100	-1 -1	10/10 10/10
Tris (2,3-dibromopropyl) phosphate DO-41 (PG)	300-600	300 200	-4 0	10/10 10/10
Diethyl dithiol oxalate EK-2251 (PG)	50-100	50 25	-3 0	10/10 10/10
2-Ethylhexyl salicylate DO-11 (PG)	200-300	200 100	+1 -1	10/10 9/10
Methoxyethyl phthalate KE-3 (PG)	300-500	300 200	+4 +1	10/10 10/10
Zinc thioacetate TH-6 (H ₂ O and NaHCO ₃)	1,000	1,000 500	0 +1	10/10 10/10
Phenyl o-aminothiobenzoate MA-11 (PG)	50	25 10	+1 +1	10/10 10/10
3-Di-n-butylaminopropyl-p-aminothiobenzoate A-9869 (H ₂ O)	200-300	200 100	+2 0	10/10 10/10
2-Diethylaminoethyl-p-amino-thiobenzoate A-9870 (H ₂ O)	200	100 50	0 +2	10/10 10/10
Zinc thiobenzoate TH-5 (H ₂ O)	50-100	50 20	-1 0	10/10 10/10
2-Acetamidophenyl thioacetate AB-14 (PG and H ₂ O)	100-200	100 50	+3 +2	10/10 10/10
N-Lauryl caproactam ND-72 (PG)	100-200	100 50	-8 9	10/10 10/10

(ESTERS and THIOESTERS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
N-Lauroyl caprolactam ND-73 (PG)	100-200	100 50	-1 -1	9/10 10/10
Diphenyl phosphate dihydrate DO-13 (H ₂ O)	500-750	200 100	-2 -1	10/10 10/10
Tris(2-chloro-2-nitro-1-butyl) phosphate CS-26 (PG)	100-200	100 50	-2 +1	9/10 10/10
2-Nitro-2-methyl trimethylene sulfite CS-399 (PG)	300-500	300 200	+1 -2	10/10 10/10
Triisopropanolamine borate BO-3 (H ₂ O)	>1,000	1,000 500	-3 +1	10/10 10/10
Trihexylene glycol baborate BO-1 (PG)	750-1,000	500 300	-4 0	10/10 10/10

AMIDES and THIOAMIDES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Chloroacetamide DO-29 (H ₂ O)	100-200	100 50	+1 -3	10/10 10/10
Iodoacetamide D-1 (PG and H ₂ O)	50-100	50 25 10	-5 -2 0	10/10 10/10 10/10
2-Chloro-N-methyl acetamide DO-35 (PG)	100-200	100 50	-6 -3	10/10 10/10
Cyanoacetamide KF-14 (PG)	200-300	200 100	-2 -1	10/10 10/10
Cyanoacethydrazide KF-18 (H ₂ O)	100-200	100 50	+1 +1	10/10 10/10
Crude thioglycolamide (sol. of thioglycolamide and ammonium thiocyanate) HA-3 (PG)	300-400	300 100	+2 +2	10/10 10/10
Methacrylamide RH-1 (H ₂ O)	200-300	200 100	+1 -1	10/10 10/10
Dibromopropamide isothionate XR-16 (H ₂ O)	50-100	50 25	-7 -1	10/10 10/10
Dithiodiglycolamide HA-4 (PG)	100-200	100 50	+2 +1	10/10 10/10
Thiodipropionamide HA-8 (PG)	>1,000	1,000 500	-5 -2	10/10 10/10
Trithiodipropionamide HA-1 (PG)	100-200	100 50	-1 -1	10/10 10/10
γ-Hydroxy-γ-cyano valeramide A-5682 (H ₂ O)	>1,000	1,000 500	-2 -2	10/10 10/10
N,N-Dimethyllevulinamide Q-7 (PG)	200-300	200 100	-2 0	10/10 10/10
N-Tris(hydroxymethyl) methyl lauramide ND-75 (PG)	200	100 50 25	-10 -2 0	10/10 10/10 10/10

(AMIDES and THIOAMIDES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity		Radiation studies	
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Thioacetamide EK-1719 (H ₂ O) CB-21 (H ₂ O)	500-1,000 300-500	600	+1	10/10
		400	+1	10/10
		300	0	10/10
		200	+1	10/10
		100	0	10/10
N,N-Dimethyl-tert-butyl-sulfenamide B-28 (PG)	200-300	200	+2	10/10
		100	+5	10/10
Acetanilid EK-3 (PG)	500	300	+1	9/10
		100	+2	10/10
Amino-acetanilid EK-13 (H ₂ O)	750-1,000	750	-2	10/10
		400	+1	10/10
		200	+2	10/10
4-Bromo-acetanilide DO-40 (PG)	250-500	250	-6	10/10
		100	0	10/10
m-Trifluoromethyl acetanilide MA-14 (PG and H ₂ O)	250-300	200	-1	10/10
		100	+3	10/10
Acetoacetanilide EK-1239 (PG and H ₂ O)	300-500	300	+3	10/10
		150	-1	10/10
α -Mercaptoacetanilide carbamate EK-734B (PG)	400-500	400	+2	9/10
		200	+3	7/10
Thioacetanilide EK-1902 (CMC)	300-400	300	-1	10/10
		200	+5	10/10
		100	+2	10/10
Thiobenzanilide EK-2010 (CMC)	100-200	100	-1	10/10
		50	0	10/10
p-Aminobenzene sulfonilamide (sulfanilamide) EK-4378 (H ₂ O); SN-7	>1,000	1,000	-3	10/10
		300	0	10/10
		200	-1	10/10
Bis 4,4'-thio sulfonamide LO-2 (PG)	200-300	200	-1	10/10
		100	+1	10/10
4,4'-Dithio-bis-n-diazinyl sulfonamide LO-4 (PG)	100	50	-2	10/10
		25	+1	10/10
o,o'-Dibenzamido-diphenyl-disulfide CY-8 (PG)	100-200	100	+1	10/10
		50	+2	10/10

(AMIDES and THIOAMIDES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
p-Chlorobenzene sulfonamide MA-3 (PG)	200-300	200 100	-4 +3	10/10 10/10
p-Aminobenzenesulphonyl-taurylamide SN-4 (H ₂ O)	500-600	500 100	-1 -3	10/10 10/10
N,N-Bis(cyanoethyl) benzene sulfonamide BE-1 (PG)	100-200	100 50	+3 -3	10/10 10/10
Dithioxamide EK-4394 (PG and H ₂ O) B-43 (PG)	100-200	150 100 100 50 50 50 20	+1 -1 -3 -3 -1 +3 +2	10/10 10/10 10/10 10/10 10/10 10/10 10/10
Dithioxamide MK-8 (PG)	100-200	100 50	-3 -1	10/10 10/10
N,N'-Dimethyldithioxamide MK-4 (PG)	50-100	50 25	0 +1	7/10 8/10
N,N'-Diethyldithioxamide MK-20 (PG)	25	10 5	-4 -1	10/10 8/10
N,N'-Di-n-propyldithioxamide MK-18 (PG)	25	20 10	-4 -1	10/10 10/10
N,N'-Di-n-pentyldithioxamide MK-22 (PG)	25-50	25 10	0 +1	10/10 8/10
N,N'-Di-n-hexyldithioxamide MK-45 (PG)	100-200	100 50	-1 -3	9/10 10/10
N,N'-Diocetyl dithioxamide MK-77 (PG)	200-300	200 100	-3 -1	10/10 9/10
N,N'-Didodecyldithioxamide MK-7 (PG)	100-200	100 50 25	0 0 -1	7/10 6/10 10/10
N,N'-Dioctodecyldithioxamide MK-34 (PG)	200-300	200 100	0 >18	10/10 3/10
N,N'-Di(10-nonadecyl)-dithioxamide MK-51 (PG)	200	200 100 50	+4 +4 +2	6/10 7/10 8/10

(AMIDES and THIOAMIDES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
N,N'-Bis(3-hexylundecyl) dithiooxamide MK-48 (PG)	200-300		200 100	0 +2	9/10 9/10
N,N'-Bis(armeen TD)- dithiooxamide MK-74 (PG)	200		100 50	-2 +2	10/10 9/10
N,N'-Bis(armeen CD)- dithiooxamide MK-75 (PG)	200		100 50	-2 +7	10/10 6/10
N,N'-Diallyldithiooxamide MK-36 (PG)	50-100		50 25	-1 +17	10/10 5/10
N,N'-Bis(2-hydroxyethyl) dithiooxamide MK-5 (PG)	750		300 200 100	+2 +15 +1	8/10 5/10 9/10
N,N'-Bis(2-hydroxy-1-propyl) dithiooxamide MK-52 (PG)	100-200		100 50	-2 +2	10/10 9/10
N,N,N',N'-Tetraethyl dithiooxamide MK-78 (PG)	100-200		100 50	-4 -4	10/10 10/10
N,N'-Bis(2-dimethylaminoethyl) dithiooxamide MK-53 (PG)	200-300		200 100	-7 +2	10/10 8/10
N,N'-Bis(3-dimethylaminopropyl) dithiooxamide MK-43 (PG)	100-200		100 50	0 +2	10/10 6/10
N,N'-Bis(carboxymethyl) dithiooxamide MK-3 (PG)	200-300		200 100 50	-7 0 -3	10/10 9/10 10/10
N,N'-Bis(1-carboxyethyl) dithiooxamide MK-29 (PG)	200-300		200 100	-5 -1	10/10 10/10
N,N'-Bis(1-carboxypropyl) dithiooxamide MK-31 (PG)	100-200		150 100	-4 +1	10/10 10/10
N,N'-Bis(3-carboxypropyl) dithiooxamide MK-32 (PG)	200-300		200 100	0 -4	10/10 10/10

(AMIDES and THIOAMIDES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
N,N'-Bis(5-carboxypentyl) dithiooxamide MK-12 (PG)	200-300	200 100	-4 +2	10/10 5/10
N,N'-Bis(carbethoxymethyl)- dithiooxamide MK-64 (PG)	200	100 50	+1 +2	10/10 6/10
N,N'-Bis(3-methoxy-1-propyl) dithiooxamide MK-44 (PG)	100	50 25	+2 -2	9/10 8/10
N,N'-Bis(dodecyloxycarbonyl-methyl) dithiooxamide MK-79 (PG)	100-200	100 50	-7 -4	10/10 9/10
N,N'-Bis(2-acetoxyethyl) dithiooxamide MK-54 (PG)	100-200	100 50	-1 -3	7/10 9/10
N,N'-Bis(3-triethoxysilyl-propyl) dithiooxamide MK-70 (PG)	200	100 50	0 +2	9/10 9/10
N,N'-Bis(2-sulfoethyl) dithiooxamide, disodium salt MK-35 (PG)	>1,000	500 300	+1 -1	9/10 10/10
N,N'-Bis(4,7-dioxo-9-hydroxy-1-nonyl) dithiooxamide MK-84 (PG)	200-300	200 100	-2 -2	10/10 10/10
N,N'-Diglucetyl dithiooxamide MK-90 (PG)	100-200	100 50	-1 +1	10/10 10/10
MK-83 (PG)	200-300	200 100 50	-4 -1 +2	2/3 9/10 8/10
N,N'-Difurfuryl dithiooxamide MK-40 (PG)	100-200	100 50	-1 +7	10/10 6/10
N,N'-Dibenzylidithiooxamide MK-1 (PG)	50-100	50 25	-3 -2	10/10 10/10
N,N'-Dicyclohexyldithiooxamide MK-2 (PG)	>1,000	500 200 100 50	-8 -6 -4 -4	10/10 10/10 10/10 10/10

(AMIDES and THIOAMIDES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
N,N'-Bis(α -methylbenzyl) dithiooxamide MK-69 (PG)	50-100	25 10	—2 0	10/10 9/10
N,N'-Bis(o-chlorobenzyl) dithiooxamide MK-63 (PG)	25	10 5	—2 —1	10/10 10/10
N,N'-Bis(p-chlorobenzyl) dithiooxamide MK-62 (PG)	100-200	100 50	—4 —3	10/10 10/10
N,N'-Bis[2-(N-ethyl-m-toluidine)-ethyl] dithiooxamide MK-67 (PG)	200	100 50	—4 —3	10/10 8/10
N,N'-Bis(p-dodecylbenzyl)- dithiooxamide MK-76 (PG)	200	100 50	—2 —1	10/10 9/10
N,N'-Ditrityl dithiooxamide MK-82 (PG)	200-300	200 100	—5 —3	10/10 10/10
Poly-1,4-bis(aminomethyl-cyclohexane) dithiooxamide MK-81 (CMC)	500-1,000	500 300	—4 —3	10/10 10/10
N,N'-Bis(2-pyridylmethyl)- dithiooxamide MK-68 (PG)	100-200	100 50	—4 +1	10/10 7/10
N,N'-Di(9-xanthenyl)dithioxamide MK-71 (PG)	200	100 50	—2 +3	10/10 5/10
Kessco χ -188 (fatty alkylamide) KE-4 (PG)	200-300	200 100	+2 +1	10/10 10/10
Kessco χ -159 (fatty alkylamide) KE-10 (PG)	100-200	100 50	—2 +2	10/10 10/10

CARBAMATES and THiocarbamates

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Butyl carbamate FO-1 (H ₂ O) EL-101 (PG)	>1,000 200-300	300	0	10/10
		200	-2	10/10
		200	+1	10/10
		100	0	10/10
β -Aminoethyl carbamate DO-48 (H ₂ O)	>1,000	1,000	-1	10/10
		500	-2	10/10
1,2-Dicarbamate ethane EL-103 (PG)	>1,000	1,000	+1	10/10
		500	+2	10/10
2-Ethynyl-2-butyl carbamate EL-108 (PG)	100-200	100	-3	10/10
		50	+1	10/10
Octyl carbamate EL-102 (PG)	100-200	100	-3	10/10
		50	0	10/10
Dodecyl carbamate FO-4 (H ₂ O)	>1,000	500	-1	10/10
		300	+2	10/10
Cyclohexyl carbamate EL-104 (PG)	200	100	+3	10/10
		50	+1	10/10
1-Ethynylcyclohexyl carbamate EL-42 (H ₂ O and PG)	300-500	250	-2	10/10
		100	+2	10/10
1-Vinylcyclohexyl carbamate EL-39 (PG)	300-500	300	-4	10/10
		100	+1	10/10
1-Ethyl cyclohexyl carbamate EL-37 (PG)	500	300	-7	10/10
		200	+2	9/10
		100	+2	10/10
		50	+3	10/10
3,5-Dimethyl-1-ethynyl cyclohexyl carbamate EL-106 (PG)	100-200	100	-4	10/10
		50	+2	10/10
4-t-Butyl-1-ethynyl cyclohexyl carbamate EL-107 (PG)	200	100	+1	10/10
		50	+2	10/10
Isopropyl-N-phenyl carbamate 1-9 (PG)	200-300	100	-5	10/10
		50	+3	7/10
		25	-1	9/10
Isopropyl-o-methyl carbanilate EL-74 (PG)	200-300	200	0	10/10
		100	+3	8/10

(CARBAMATES and THiocarbamates)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
Isopropyl-p-methyl carbanilate EL-72 (PG)	150-200		100 50	+3 +2	10/10 10/10
m-Chlorophenyl-carbamic acid isopropyl ester B-25 (PG)	>1,000		1,000 500	0 +3	8/10 10/10
N-Phenacyl ethyl urethane EL-109 (PG)	100		50 25	0 +1	10/10 10/10
(9-Ethynyl fluorenyl) carbamate EL-105 (PG)	200		100 50	-3 +1	10/10 9/10
α -(Thio carbamyl)acetanilide UCTL-1744 (PG and H ₂ O)	50-100		50	0	10/10
p,p'-Bis(α -thiol carbamyl-acetamido) biphenyl UCTL-1766 (H ₂ O)	200		100	+3	10/10
Manganese methyl dithiocarbamate P-4 (CMC)	>1,000		1,000 500	-1 -2	10/10 10/10
Zinc dimethyl dithiocarbamate P-2 (CMC)	200		100 50	-3 +2	10/10 10/10
Ferrous dimethyl dithiocarbamate P-3 (CMC)	>1,000		1,000 500	-2 +2	10/10 10/10
Copper alkyl dithiocarbamate B-34 (PG)	100		75 40 10	-4 -4 -2	10/10 10/10 9/10
Zinc dibutyl dithiocarbamate GY-5 (PG)	100		50 25	+1 0	10/10 10/10
Tetra-methylthiuram monosulfide EK-P-6255 (PG and H ₂ O) B-32 (PG)	300-500		300 250 150 100	-3 0 +3 +4	10/10 10/10 9/10 8/10
Dimethyldithiocarbamic acid dimethylammonium salt EK-812 (H ₂ O)	>500		750 500 250	+6 +1 0	5/10 9/10 10/10
Glycidyl dimethyldithiocarbamate T-13 (PG)	200-300		100 50	+2 -4	8/10 10/10

(CARBAMATES and THiocarbamates)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
N,N'-Dimethyl-tert-butyl-sulfenylidithiocarbamate B-20 (PG and H ₂ O)	100-200	100		0
		50		+2
		50		0
		25		0
Methylene bis(dimethyl-dithiocarbamate) SN-32 (PG)	200	100		+1
		50		+4
		25		-1
Bis(dimethylthiocarbamyl) disulfide (Thiuram) P-5 (CMC); B-30 (PG); EK-2089 (CMC)	200-300	200		-3
		150		0
		150		+3
		100		+1
		100		-2
		100		-3
		50		+4
2-Nitrophenyl thiodimethyl dithiocarbamate SN-33 (PG)	300	200		0
		100		+1
		50		-2
		25		-1
2,4-Dinitrophenyl-dimethyl-dithiocarbamate SN-31 (PG)	200	100		0
		50		+3
		25		+1
5-Amino-1,2,4-thiadiazole-3-thiol hydrochloride A-10967 (H ₂ O)	10-25	10		0
		5		-1
4-Methyl-5-methylimino-1,2,4-dithiazolidine-3-thione monohydrobromide PD-8 (PG)	100-200	100		+2
		50		+1
Thiuret hydrochloride R-48 (H ₂ O)	50-100	50		-5
		20		+1
4-Chlorobenzyl N,N-dimethyl-amino dithiocarbamate T-5 (PG)	200-300	200		-1
		100		-2
Carbo-4-chloro-phenoxyethyl dimethyl dithiocarbamate T-12 (PG)	200-400	200		0
		100		-2
2-Dimethyl dithiocarbamyl benzothiazole T-7 (PG)	100-200	100		+1
		50		+2

(CARBAMATES and THiocarbamates)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
Diethyl dithiocarbamic acid (sodium salt) EK-2596 (H ₂ O)	>400	1,000	1,000	+2	10/10
		800	800	-1	10/10
		600	600	+3	10/10
		400	400	-1	10/10
		400	400	-1	10/10
Diethyldithiocarbamic acid diethylammonium salt EK-2635 (H ₂ O)	500-1,000	750	750	+2	8/10
		500	500	+2	10/10
		250	250	-1	10/10
3-[Bis(2-hydroxyethyl) aminoethyl]-2-thiazolidine thione PD-2 (PG)	200-300	200	200	-3	10/10
		100	100	1	10/10
Trans-2,5-dimethyl-1-piperazine-carbodithioic acid PD-10 (PG)	200	100	100	0	10/10
		50	50	-3	10/10
Benzyl N(3-carboxypropyl) dithiocarbamate PD-6 (PG)	100-200	100	100	-7	10/10
		50	50	2	10/10
2-Mercaptobenzothiazole GY-3 (PG)	100-200	100	100	-2	10/10
		50	50	+3	10/10
2-Benzothiazolyl diethyldithiocarbamate A-3841 (PG)	>1,000	500	500	-1	10/10
		200	200	-3	10/10
2-(4-Morpholinyl-thio)-benzothiazole CY-7 (PG)	100-200	100	100	-1	10/10
		50	50	-1	10/10
Zinc benzothiazyl-2-mercaptide GY-7 (PG)	200-300	200	200	-2	10/10
		100	100	3	10/10
Tetra-ethylthiuram disulfide B-33 (Cottonseed oil)	1,000	750	750	-2	10/10
		500	500	-6	10/10
		200	200	-3	10/10
		100	100	0	10/10
Bis(carboxymethyl)ethylene dithiocarbamate T-6 (PG)	500	500	500	3	10/10
		200	200	2	9/10
Sodium dibutyl dithiocarbamate (47% sol.) B-35 (H ₂ O)	300-500	300	300	-5	10/10
		100	100	1	10/10

(CARBAMATES and THIOCARBAMATES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Carbomethoxymethyl benzylmethyl dithiocarbamate T-11 (PG)	1,000	500 200	4 1	10/10 9/10
Carbethoxymethylmorpholinyl-dithiocarbamate T-9 (PG)	1,000	500 200	0 0	10/10 9/10
Carboxymethylpyrrolidyl-dithiocarbamate T-10 (PG)	300-500	200 100	-6 +1	10/10 10/10
Carbethoxymethyl p-chlorophenyl dithiocarbamate T-8 (PG)	200-300	100 50	+5 +1	10/10 10/10
Bis(pentamethylenethiuram)-tetrasulfide B-31 (PG)	200	100 50	-3 +2	10/10 10/10
N-Methyl-rhodanine T-2 (PG)	400	200 100	+3 +1	10/10 10/10
N-Carboxymethylrhodanine T-3 (PG)	>1,000	500 200	-4 +1	10/10 10/10
N-(4-Chlorophenyl)rhodanine T-1 (PG)	200	100 50	-2 -5	9/10 10/10
Aminomercaptothiadiazole B-46 (PG)	200-300	200 100	-3 0	10/10 10/10

UREAS and THIOUREAS

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Urea B-111 (H ₂ O)	>1,000	1,000 750	-1 +1	10/10 10/10
Methyl allaphanate EL-70 (PG)	500	300 200	+1 +4	10/10 9/10
Hydantoic acid DO-67 (H ₂ O)	>1,000	500 300	-5 0	10/10 10/10
3-(p-Chlorophenyl)-1,1-dimethyl-urea P-8 (PG); XR-41 (H ₂ O and PG)	1,000	500 300 200 100	-3 +1 0 +1	10/10 10/10 10/10 10/10
1-(3,4-Dichlorophenyl)-1,1-di-methylurea P-7 (PG); XR-42 (PG and H ₂ O)	500-1,000	1,000 500 200 100	0 -3 +1 +1	10/10 10/10 10/10 10/10
Carbanilide EK-534 (PG)	200-300	200 100 50	+2 -1 +5	10/10 10/10 10/10
1,3-Bis-(2-benzothioxoly-mercaptomethyl) urea B-18 (CMC)	100-200	100 50 25 20	--6 --6 0 -1	10/10 10/10 10/10 10/10
N,N'-Diethyldcarbanilide EK-1047 (PG)	200	50 20	-1 0	10/10 10/10
Thiourea EK-497 (H ₂ O)	100-200	100 50	+4 -3	10/10 10/10
Ethythiourea D-7 (H ₂ O)	>1,000	1,000 400	+2 +1	10/10 10/10
1-Acetyl-2-thiourea EK-4890 (H ₂ O)	100-200	100 50	+1 +4	9/10 10/10
Isopropylthiourea D-6 (PG)	100-200	100 50	+4 +3	9/10 10/10
n-Butylthiourea D-5 (H ₂ O)	300-400	300 100	+1 0	10/10 10/10
Hexanoyl thiourea B 103 (PG)	500-1,000	500 300	-2 -4	10/10 10/10

(UREAS and THIOUREAS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Heptanoyl thiourea B-104 (PG)	500-1,000	500 300	-3 -4	10/10 10/10
Octanoyl thiourea B-105 (PG)	500-1,000	500 300	+2 -3	10/10 10/10
1,3-Bis-(3-carboxypropyl)-thiourea MS-1 (PG)	200-300	200 100	0 -3	7/10 10/10
1,3-Bis-(5-carboxypentyl)-thiourea MS-2 (PG)	500-1,000	500 200	-9 -4	10/10 10/10
Dithiobiuret B-44 (PG); EK-P-6281	50-75	75 50 40	0 -3 0	10/10 10/10 9/10
N,N'-Bis-thiocarbamyl hydrazine B-55 (H ₂ O)	100-200	100 50	0 -1	10/10 10/10
Thiocarbamylguanidinium ortho-phosphate A-10479 (H ₂ O)	>1,000	1,000 500	+1 -2	10/10 10/10
Dimethylol thiourea B-74 (PG)	1,000-1,500	500 200	-1 -1	10/10 10/10
1,3-Diethyl-2-thiourea EK-1803 (PG)	500-1,000	500 200	+4 -1	9/10 10/10
N-Methyl-N'-methallyl thiourea MO-4 (H ₂ O)	500-750	300 200	+9 0	7/10 10/10
1,3-Di-n-butyl-2-thiourea EK-2138 (PG and H ₂ O)	800-1,000	500 200	-2 +4	10/10 10/10
6,6'-Thioureylene dihexanoic acid or (1,3-Bis(5-carboxy-pentyl)-thiourea) PI-7 (H ₂ O)	>1,000	1,000 500	-5 -5	10/10 10/10
L-Glucosethiourea D-8 (H ₂ O)	400	200 50	-4 +2	10/10 10/10
1-Phenyl-2-thiourea EK-1569 (H ₂ O)	25	10 5	0 0	10/10 10/10
p-Hydroxyphenylthiourea B-75 (PG)	100-200	50 25	-1 -4	10/10 10/10

(UREAS and THIOUREAS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
p-Thiourea benzoic acid EL-9 (H ₂ O)	>1,000		100	0	10/10
1-Phenyl- α -thiohydantoic acid EK-734A (PG)	200-300	200		+6	10/10
		100		+1	10/10
		50		+1	10/10
1,1-Diphenyl-2-thiourea EK-7087 (PG)	200	100		-2	10/10
		25		0	10/10
Thiocarbanilide EK-245 (CMC)	500-1,000	600		+1	10/10
		400		+5	9/10
		200		0	10/10
4,4'-Dimethylthiocarbanilide EK-3114 (PG)	400	200		0	10/10
		100		+1	10/10
2,2'-Dimethylthiocarbanilide EK-1651 (PG and H ₂ O)	100	100		-3	10/10
		50		0	10/10
2,2'-Diethylthiocarbanilide EK-6859 (PG)	200	200		0	10/10
		50		+1	10/10
Phenyl-benzoyl-thiourea K-1473 (PG)	50	25		-6	10/10
		10		+3	10/10
3-Benzoyl-1-(p-tolyl)-2-thiourea K-1470 (PG)	100-200	100		-3	10/10
		50		0	10/10
3-Benzoyl-1-(o-tolyl)-2-thiourea K-1471 (PG)	100-200	100		-2	10/10
		25		--4	10/10
3-Benzoyl-1-(o-hydroxyphenyl)-2-thiourea K-1482 (PG)	200-300	200		-4	10/10
		100		--2	10/10
3-Benzoyl-1-(p-hydroxyphenyl)-2-thiourea K-1481 (PG)	100-200	100		0	10/10
		50		-1	10/10
3-Benzoyl-1-(p-dimethylamino-phenyl)-2-thiourea K-1467 (PG)	100	50		-1	10/10
		25		0	10/10
3-Benzoyl-1-(o-chlorophenyl)-2-thiourea K-1469 (PG)	100-200	100		-1	10/10
		50		0	10/10
3-Benzoyl-1-(m-chlorophenyl)-2-thiourea K-1476 (PG)	200-300	200		0	9/10
		100		+2	10/10

(UREAS and THIOUREAS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
3-Benzoyl-1-(p-chlorophenyl)-2-thiourea K-1477 (PG)	200	200 100	-5 -1	10/10 10/10
3-Benzoyl-1-(2,5-di-chlorophenyl)-2-thiourea K-1466 (PG)	100-200	100 50	-4 -3	10/10 10/10
Benzoyl-a-naphthyl-thiourea K-1451 (PG)	100-200	100 50	-7 +4	10/10 10/10
3-Benzoyl-1-(p-biphenyl)-2-thiourea K-1450 (PG)	100-200	100 50	-1 0	10/10 10/10
3-Benzoyl-1-(beta-naphthyl)-2-thiourea K-1475 (PG)	200-300	200 100	-1 0	10/10 10/10
3-Benzoyl-1-(o-bicyclohexyl)-2-thiourea K-1468 (PG)	100-200	100 50	-1 0	10/10 10/10
3-Benzoyl-1-[p-(phenyl-azo)-phenyl]-2-thiourea K-1480 (PG)	200-300	200 100	-5 0	10/10 10/10
1-(1-Naphthyl)-2-thiourea EK-P-5976 (PG)	10-50	10 5	0 +5	10/10 10/10
1-Ethyl-1-(1-naphthyl)-2-thiourea EK-7162 (PG)	200	100 50	-3 0	10/10 10/10
1-Methyl-2,4-phenylene bis-1,1'-(2-thiourea) K-1571 (PG)	500-750	500 200	0 -3	10/10 10/10
m-Phenylene-bis-benzoyl-thiourea K-1479 (PG)	100-200	100 50	-5 +1	10/10 10/10
1-Phenylene-bis-1,1'-(3-benzoyl-2-thiourea) K-1478 (PG)	100-200	100 50	-5 +1	10/10 10/10
Thiocsemicarbazide EK-1276 (H ₂ O)	1-5	1 0.5	+3 +2	10/10 10/10

(UREAS and THIOUREAS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
4-Phenyl-3-thiosemicarbazide EK-5426 (H ₂ O); EL-45 (PG)	15-25	25	+1	10/10
		15	-1	10/10
		10	-1	10/10
1-(p-Toluenesulfonyl)-4-n-butyl-thiosemicarbazide CM-1 (PG)	200-300	200	-4	10/10
		100	+1	10/10
Thiocarbohydrazide EK-7372 (H ₂ O)	5	3	0	10/10
		1	-1	10/10
1,5-Diphenyl-3-thiocarbohydrazide EK-3110 (PG)	200	100	-8	10/10
		25	0	9/10
Diphenylthiocarbazone EK-3092 (PG)	200-300	200	+1	10/10
		100	+1	10/10
		50	+5	10/10
N,N-Diethylselenourea B-100 (PG)	10-25	10	+6	10/10
		5	+2	9/10

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Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
2-Aminoethylisothiuronium dichloride XR-32 (H ₂ O)	250-350	350	>22	2/7
		300	+17	5/10
		250	>20	4/10
		200	+ 4	10/10
		100	+ 6	9/10
2-Aminoethylisothiuronium dibromide XR-31 (H ₂ O)	400-500	450	>22	1/10
		400	>20	3/10
		350	>24	2/10
		300	+ 2	10/10
		200	+ 2	10/10
2-Aminoethylisothiuronium diiodide B-54 (H ₂ O)	900-1,000	850	>20	4/10
		750	+ 6	7/10
		500	+ 5	10/10
		200	+ 1	10/10
2-Aminoethylisothiuronium sulfate B-53 (H ₂ O)	300-400	500	+13	4/6
		400	>18	0/6
		300	+12	5/10
		200	5	9/10
		50	- 1	9/10
2-Aminoethylisothiuronium dinitrate B-52 (H ₂ O)	500-600	400	+18	5/10
		200	- 1	10/10
		50	+ 3	10/10
2-Aminoethylisothiuronium phosphate B-79 (H ₂ O)	500-1,000	500	0	10/10
		200	-4	10/10
2-Aminoethylisothiuronium acetate XR-33 (H ₂ O)	>2,000	1,500	0	10/10
		1,000	+2	10/10
		750	+1	10/10
		500	+5	10/10
		300	+1	10/10
		250	0	10/10
		200	+4	10/10
2-Aminoethylisothiuronium diacetate B-13 (H ₂ O)	500-1,000	500	+2	10/10
		200	-5	10/10
		100	-4	10/10
2-Aminoethylisothiuronium perchlorate B-118 (H ₂ O)	500-750	300	>20	0/5
		250	+10	7/10
		200	0	7/10
Acetyl isothiuronium chloride B-101 (H ₂ O)	100-200	100	-2	10/10
		50	+2	10/10

(ISOTHIOUREAS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity		Radiation studies	
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
S-Acetyl-1-phenyl thiourea EL-93 (PG)	25-50	10 5	-1 +2	10/10 10/10
N-Methylaminoethyl isothiouronium sulfate B-87 (H ₂ O)	100-200	100 50	+3 -2	9/10 10/10
1-Acetyl-2-(2-methylaminoethyl)-isothiouronium sulfate B-86 (H ₂ O)	50-100	50 25	+2 -1	10/10 10/10
N-Ethyl-2-aminoethylisothiouronium sulfate B-85 (H ₂ O)	100	50 25	+2 -1	10/10 10/10
N-Ethyl-2-aminoethylisothiouronium diacetate B-60 (H ₂ O)	200-300	200 100	-1 +1	10/10 10/10
2-Isopropylaminoethylisothiouronium sulfate B-115 (H ₂ O)	200-300	100 50	0 -1	10/10 10/10
2-Tert-butyl aminoethyl isothiouronium sulfate B-114 (H ₂ O)	200-300	200 100	-7 +2	10/10 10/10
2-Diethylaminoethylisothiouronium chloride A-173 (H ₂ O)	100-200	100 50	-2 -2	10/10 10/10
N-Butyl-2-aminoethylisothiourea dihydrochloride EL-1 (H ₂ O)	>30	20 10	+2 +1	10/10 10/10
N-Butyl-2-aminoethylisothiouronium sulfate B-89 (H ₂ O)	100	50 25	+1 0	10/10 10/10
1-Acetyl-2-(2-butylaminoethyl)-isothiouronium sulfate B-88 (H ₂ O)	25-50	25 15	+1 -4	10/10 10/10
4-(2-Aminothiazolyl)methyl-isothiouronium dichloride A-1149 (H ₂ O)	200-300	200 100	+2 -2	10/10 10/10
2-Phenacylmino-1-ethylisothiourea hydrochloride EL-88 (H ₂ O)	100-200	100 50	-1 +2	10/10 10/10

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Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Methylene isothiourea dihydrobromide EL-95 (H ₂ O)	100	50 25	-1 +3	10/10 10/10
Ethyl-di(isothioureaethyl)-amine trihydrochloride EL-8 (PG and H ₂ O)	30-50	25	+1	10/10
3-[2-(Isothioureido)ethyl thio]propyl isothiourea dihydrochloride EL-71 (H ₂ O)	100-200	100 50	+3 +6	10/10 7/10
N,N-Bis-(2-guanylthioethyl) methylamine trihydrochloride A-360 (H ₂ O)	200	50 25	-1	10/10 10/10
Trimethyleneisothiouronium bromide IN-2 (H ₂ O)	200-300	200 100	-1 +2	10/10 10/10
Decane-1,10-diisothiourea dihydrobromide EL-92 (H ₂ O)	100	50 25	-3 +3	10/10 10/10
1,10-Decane bis-(1,3,3-trimethyl-2-isothiourea) dihydrobromide EL-90 (H ₂ O)	50-100	20 10	-2 +3	10/10 10/10
1-Methyl-2-(2-aminoethyl)-isothiouronium sulfate B-72 (H ₂ O)	300-400	300 100	0 -2	8/10 10/10
1-Ethyl-2-(2-aminoethyl)-isothiouronium sulfate B-71 (H ₂ O)	100-200	100 25	-2 -4	10/10 10/10
1-Ethyl-2-(2-aminoethyl)-isothiouronium dibromide B-61 (H ₂ O)	100-200	100 25	+2 -2	10/10 10/10
1-Acetyl-2-(2-aminoethyl)-isothiouronium dichloride B-8 (H ₂ O)	400-500	400 200	+1 +2	10/10 9/10
1-Acetyl-2-(2-aminoethyl)-isothiouronium sulfate B-70 (H ₂ O)	500-600	400 300 200 100	>19 + 8 >19 + 2	2/10 10/10 2/10 9/10

(ISOTHIOUREAS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
1-Acetyl-2-(2-aminoethyl)-isothiouronium acetate B-56 (H ₂ O)	300	100 50 20		-1 -4 +5	10/10 10/10 10/10
1-Allyl-2-(2-aminoethyl)-isothiouronium sulfate B-68 (H ₂ O)	100-200	100 50		+3 +1	10/10 10/10
Hexanoyl-2-(2-aminoethyl)-isothiouronium sulfate B-106 (H ₂ O)	400-500	300 100		-1 +1	10/10 10/10
Heptanoyl-2-(2-aminoethyl)-isothiouronium sulfate B-107 (H ₂ O)	400-500	300 100		-1 +2	10/10 10/10
Octanoyl-2-(2-aminoethyl)-isothiouronium sulfate B-108 (H ₂ O)	500-750	500 300		-5 +1	10/10 10/10
1,3-Dimethyl-2-(2-aminoethyl)-isothiouronium sulfate B-83 (H ₂ O)	200-300	150 100		-3 +1	9/10 10/10
1,3-Diethyl-2-(2-aminoethyl)-isothiouronium dibromide B-64 (H ₂ O)	50-100	50 25		-3 -2	10/10 10/10
1,3-Diethyl-2-(2-aminoethyl)-isothiouronium sulfate B-69 (H ₂ O)	50-100	50 25		+2 -1	10/10 10/10
N-Methyl-N-methallyl-2-(2-aminoethyl)-isothiouronium sulfate B-97 (H ₂ O)	5-10	5 2		0 0	10/10 10/10
1,3-Di-isopropyl-2-(2-aminoethyl)-isothiouronium sulfate B-66 (H ₂ O)	100-200	100 50		+4 +1	10/10 10/10
1,3-Di-n-butyl-2-(2-aminoethyl)-isothiouronium sulfate B-67 (H ₂ O)	25-50	25 10		+4 0	10/10 10/10
1,1,3,3-Tetramethyl-2-aminoethyl-isothiouronium dibromide B-92 (H ₂ O)	5-7.5	5 1		-4 -2	10/10 10/10

(ISOTHIOUREAS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
1-Phenyl-2-(2-aminoethyl)-isothiouronium sulfate B-65 (H ₂ O)	100	50 25	-3 0	10/10 10/10
1-Phenyl-2-(2-aminoethyl)-isothiouronium dibromide B-62 (H ₂ O)	75-100	75 25	0 +2	10/10 10/10
1-Methyl-1-phenyl-2-(2-aminoethyl)-isothiouronium sulfate B-96 (H ₂ O)	>200	100 50	-1 0	10/10 10/10
1-(p-Nitrophenyl)-2-(2-aminoethyl)-isothiouronium sulfate B-80 (H ₂ O)	300-500	300 100	+17 +2	5/10 10/10
1-(p-Hydroxyphenyl)-2-(2-aminoethyl)-isothiouronium sulfate B-73 (H ₂ O)	100-200	100 25	-4 -1	10/10 10/10
1-(m-Tolyl)-2-(2-aminoethyl)-isothiouronium sulfate B-84 (H ₂ O)	100-200	75 25	+1 -6	9/10 10/10
m-Chlorophenyl-2-(2-aminoethyl)-isothiouronium sulfate B-98 (H ₂ O)	100	50	-1	10/10
1-[4(p-Propionylphenylazo)-3-hydroxyphenyl]-2-(2-aminoethyl)-isothiouronium sulfate B-82 (H ₂ O)	50-100	50 25	-2 -3	10/10 10/10
1-p-Tolyl-2-(2-aminoethyl)-isothiouronium sulfate B-95 (H ₂ O)	50-100	50 25	0 0	10/10 10/10
1-(<i>o</i> -Naphthyl)-2-(2-aminoethyl)-isothiouronium sulfate B-76 (H ₂ O)	50-100	50 25	0 -4	10/10 10/10
1-(<i>p</i> -Naphthyl)-2-(2-aminoethyl)-isothiouronium sulfate B-77 (H ₂ O)	100-200	100 50	0 -7	10/10 10/10
<i>o</i> -Biphenyl-2-(2-aminoethyl)-isothiouronium sulfate B-99 (H ₂ O)	100-200	100 50	-5 -2	10/10 10/10

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Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
1-Ethyl-1-(α -naphthyl)-2-(2-aminoethyl)-isothiouronium sulfate B-81 (H ₂ O)	50-100	50 25	0 + 1	10/10 10/10
1 (L-Glucose)-2-(2-aminoethyl)-isothiouronium dibromide B-63 (H ₂ O)	500-750	500 200	+ 11 + 3	10/10 9/10
Ethylene-2-(2-aminoethyl)-isothiouronium dichloride B-11 (H ₂ O)	>200	200 100 50	+ 1 + 6 3	10/10 10/10 10/10
2-(Acetylaminoethyl)-isothiobarbituric acid B-38 (H ₂ O)	1,000-2,000	1,000 500	+ 3 + 4	10/10 9/10
N-[2-(3-Benzylthiazolidylidene)]-aniline A-841 (PG)	200-300	200 100	+ 2 0	10/10 10/10
2-(Acetamido-tert-butyl)-isothiocarbazide B-39 (H ₂ O)	>2,000	1,000 500	+ 2 + 2	10/10 10/10
Guanyl disulfide dihydrochloride A-11071 (H ₂ O)	100-200	100 50	+ 2 + 2	10/10 10/10
2-Aminobutyl isothiouronium sulfate B-94 (H ₂ O)	50-75	50 25	+ 1 + 1	10/10 10/10
2-Aminopropylisothiouronium sulfate B-90 (H ₂ O)	250-500	250 100	+ 22 + 7	1/10 9/10
2-Amino-2-methylpropyl-isothiouronium sulfate B-91 (H ₂ O)	200-300	200 100	+ 22 + 5	4/10 10/10
D(+)-Erythro-3-amino-2-butyl-isothiouronium sulfate B-117 (H ₂ O)	100-200	100 50	+ 3 0	10/10 10/10
dL-Threo-3-amino-2-butyl-isothiouronium sulfate B-109 (H ₂ O)	>200	200 100	+ 3 4	10/10 10/10

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Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD_{50} in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
2-Amino-pentyl-isothiouronium sulfate B-113 (H ₂ O)	50-100	50 25	-4 +2	10/10 10/10
Mixture of: α-Methyl-β-propyl aminoethyl isothiouronium sulfate α-Propyl-β-methyl aminoethyl isothiouronium sulfate B-125 (H ₂ O)	50-100	50 25	+1 0	10/10 10/10
3-Amino-3-methyl-2-butyl isothiouronium sulfate B-110 (H ₂ O)	100-200	100 50	0 -6	10/10 10/10
α-Propyl-β,β-dimethyl aminoethyl-isothiouronium sulfate B-126 (H ₂ O)	10-25	10 5	-1 +1	10/10 10/10
α-Phenyl aminoethyl-isothiouronium sulfate B-123 (H ₂ O)	25-50	25 10	-1 -3	10/10 10/10
2-Amino-1-phenyl-propyl-isothiouronium sulfate B-112 (H ₂ O)	5-10	7.5 5	+2 -1	10/10 10/10
1-Phenyl-2-aminobutyl-isothiouronium sulfate B-116 (H ₂ O)	5-10	5 1	+1 -2	10/10 10/10
α-Phenyl-β,β-dimethyl aminoethyl-isothiouronium sulfate B-124 (H ₂ O)	20-25	10 5	0 0	10/10 9/10
1-Benzoyl-2-(acetamido-tert-butyl) isothiohydantoin B-49 (PG)	200-300	200 100	-1 +2	10/10 10/10
1-Acetyl-2-(acetamido-tert-butyl) isothiohydantoin B-37 (H ₂ O)	300	200 100	+1 -1	10/10 10/10
3,6-Bis-(2-guanylthioethyl)-2,5-diketopiperazine dihydrochloride A-4006 (H ₂ O)	100-200	100 50	0 -1	10/10 10/10

(ISOTHIUREAS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
4-Phenyl-6-oxy-pyrimidine-2-thioglycolic acid (sodium salt) EL-6 (PG and H ₂ O)	25-50	25 10	+3 -3	10/10 10/10
Allyl-isothiourea hydrobromide EL-13 (H ₂ O)	>100	100 25	+1 0	10/10 10/10
S-(n-Butyl)-isothiourea hydrochloride EL-89 (H ₂ O)	500-750	500 200	+2 +2	5/10 10/10
2-Octyl-2-thiopseudourea mono-hydrochloride PD-11 (PG)	~100	50 55	0 -1	10/10 10/10
2-(3-Dimethylaminopropyl)-2-thiopseudourea dihydrochloride PD-40 (H ₂ O)	300-500	300 200	+1 -1	10/10 10/10
3-Diethylaminopropylisothiourea A-9337 (PG)	200-300	200 100	+2 -1	10/10 10/10
2-(2,5-Dihydroxyphenyl)-2-thiopseudourea monohydrochloride PD-17 (H ₂ O)	50-100	50 25	0 -3	10/10 10/10
2-Benzylisothiuronium chloride EK-2124 (H ₂ O)	50-100	50 20	-1 -4	10/10 9/10
S-Benzylisothiuronium pantothenate NO-1 (H ₂ O)	100-200	50 25	+2 -1	10/10 10/10
Phenacyl isothiourea hydrochloride EL-94 (H ₂ O)	100-200	100 50	-3 +3	10/10 10/10
Phthalimidomethylisothiuronium bromide A-964 (H ₂ O)	100-200	50 25	+1 -1	10/10 10/10
2,2'-(p-Phenylene dimethylene) bis(2-thiopseudourea) dihydrochloride PD-9 (H ₂ O)	10-25	10 5	-1 -3	10/10 10/10
2,4,6-Tri-methyl-m-xylylene isothiourea dihydrochloride EL-91 (H ₂ O)	50-100	25 10	-3 +3	10/10 10/10

(ISOTHIOURreas)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
2,2'-Oxybis-(p-phenylene-methylene)-bis-2-thio-pseudourea dihydrochloride DO-15 (H ₂ O)	50-100	50 25	-5 -4	10/10 10/10
Bis-[p,p'-(isothioureidomethyl)-phenyl] sulfone dihydrochloride EL-4 (H ₂ O)	50-100	50 25	+2 -1	10/10 10/10
Ethyl isothiourea hydrobromide EL-18 (H ₂ O)	500-1,000	500 500 400	>22 + 2 + 4	3/7 10/10 7/10
3-Phthalimidopropylisothiuronium bromide A-317 (H ₂ O)	100-200	75 25	-1 0	10/10 10/10
1-Guanyl-mercapto-3-mercapto-benzimidazole propane dihydrochloride EL-5 (H ₂ O)	100	50 25	- 1 + 1	10/10 10/10
4-Amino-4-carboxy-n-butyl-isothiouronium dibromide A-404 (H ₂ O)	500-1,000	500 200	-1 -2	10/10 10/10
Pentamethylene isothiourea dihydrobromide EL-3 (H ₂ O)	200-500	150 50	-3 0	10/10 10/10

GUANIDINES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD_{50} in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Guanidine hydrochloride EK-749 (H ₂ O)	500	300 100	+1 +2	10/10 10/10
α -(Guanidino)hydrocinnamic acid A-9096 (PG)	>1,000	1,000 500	+3 0	10/10 10/10
Guanidine thiocyanate EK-705 (H ₂ O)	300-500	300 100	+4 +1	10/10 10/10
2-Diethylaminoethylguanidinium sulfate A-7189 (H ₂ O)	500-1,000	300 200	-1	10/10 10/10
Guanidoethyl disulfide (GED) B-93 (H ₂ O)	>1,000	1,000 500	-2 -2	10/10 10/10
1-Sulfo-3-guanylurea A-6600 (PG)	200	100 50	+2 0	10/10 10/10
Tetramethylene bis-guanidinium sulfate A-5080 (H ₂ O)	300-500	200 100	0 -3	10/10 10/10
β -phenylguanidine EK-1270 (PG and H ₂ O); R-49	25-50	25 20 10	-1 +1 +8	8/10 9/10 10/10
Di-o-tolylguanidine A-6598 (PG)	25-50	25 10	-2 0	10/10 10/10
1-p-Aminophenylbiguanide hydrochloride A-6599 (H ₂ O)	200-300	200 50	-1 5	10/10 10/10
1,3 Bis (3-pyridyl)-2-(2-hydroxyethyl)guanidine A-9673 (PG)	200-300	200 100	0 -1	10/10 10/10
1,3-Bis-(2-pyridyl)-2-(2-dimethylaminoethyl)guanidinium trichloride A-1408 (H ₂ O)	100-200	100 50	0 -2	10/10 10/10
α -Tris-(p-nitrophenyl) guanidine A-12822 (PG)	300-500	300 100	0 +2	10/10 10/10

(GUANIDINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
1,3-Bis-(p-nitro-phenyl)-2-p-ethoxyphenylguanidine A-12897 (PG)	>1,000	750	-8	10/10
		500	-2	9/10
		200	-2	10/10
1,3-Diacetyl- α -triphenyl-guanidine A-12969 (PG)	>500	500	-1	10/10
		200	0	10/10
N,N-Dibenzyl-2-imidazolinyl-amine hydroiodide A-5424 (PG)	>1,000	200	-6	10/10
		50	-2	10/10
Guanine hydrochloride S-1 (PG)	200-300	300	-1	10/10
		200	+2	10/10
		100	0	10/10

AMINES and IMINES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Hydroxylamine hydrochloride EK-340 (H ₂ O)	10-25	10 5		-2 -3
Tetraethyl ammonium bromide DO-32 (H ₂ O)	50-100	50 25		0 -2
Taurine CB-5 (H ₂ O)	>1,000	1,000 500		-2 0
1-Amino-1-propane sulfonic acid DO-27 (H ₂ O)	>1,000	500 200		0 -1
Sodium N-methyl tauride of cocoanut oil MO-3 (H ₂ O)	300-500	300 100		-1 -3
N,N-Diethyl ethylenediamine AM-1 (H ₂ O)	300-500	300 100		-9 -4
N,N-Diisopropyl ethylene-diamine AM-2 (H ₂ O)	200	100 50		+2 +2
N'-(Butyl)-2-methyl-1,2-propanediamine CS-1745 (H ₂ O)	200	100 50		-4 0
Methane-1,8-diamine RH-4 (H ₂ O)	50-100	50 25		+5 0
Benzylamine hydrochloride EL-82 (H ₂ O)	500-750	300 100		0 +1
N-Methylbenzylamine hydrochloride EL-81 (H ₂ O)	300-500	200 100		-2 +1
Dimethylbenzylamine hydrochloride EL-78 (H ₂ O)	200	100 50		-1 +3
2-Methylbenzylamine hydrochloride EL-49 (H ₂ O)	200-300	200 100		+1 -1
N,N-Dimethyl- β -phenyl ethylamine hydrochloride EL-79 (H ₂ O)	200-300	100 50		+3 +3

(AMINES and IMINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
Epinephrine UCTL-5 (H ₂ O)	>5		5 3.3 3	-7 0 +3	10/10 7/10 6/10
N-Methyl-N-propargylbenzyl-amine hydrochloride A-19120, (H ₂ O)	300		200 100	-4 +4	10/10 9/10
1-Amino-1-phenylhexane hydrochloride EL-14 (H ₂ O)	25-50		25 5	+2 -1	10/10 10/10
α -Phenylethylamine hydrochloride EL-76 (H ₂ O)	100-200		100 50	-1 +3	10/10 10/10
N-Methyl phenethylamine hydrochloride EL-29 (H ₂ O)	50-100		50 25	+5 -1	10/10 10/10
p-Methoxyphenethylamine EL-52 (PG)	100-200		50 25	+2 0	10/10 10/10
β -3,4-Dichlorophenylethyl-amine hydrochloride EL-28 (H ₂ O)	50-100		50 25	+5 +1	10/10 10/10
d-Desoxyephedrine hydrochloride EL-36 (H ₂ O)	50-100		10 5	+2 0	10/10 10/10
2-Phenyl-1-aminobutane hydrochloride EL-19 (H ₂ O)	50-100		50	0	10/10
γ -Phenyl propylamine hydrochloride EL-41 (H ₂ O)	50-100		100 50	-1 +2	10/10 10/10
N-Methyl-3-phenyl propylamine hydrochloride EL-75 (H ₂ O)	200-300		100 25	0 +1	10/10 10/10
N-Methyl-3-(p-chlorophenyl) propylamine hydrochloride EL-73 (H ₂ O)	100-200		100 50	+3 +2	10/10 10/10
N,N-Dimethyl- γ -phenyl propylamine hydrochloride EL-40 (H ₂ O)	100-200		100 50	-1 -2	9/10 10/10

(AMINES and IMINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
N,N-Dimethyl-3-(p-chlorophenyl) propylamine hydrochloride EL-77 (H ₂ O)	100-200	100 50	-1 +3	10/10 10/10
2-Phenyl hexylamine hydrochloride EL-16 (H ₂ O)	50-100	50 10	-1 +1	10/10 10/10
N,N-Diethyl 2-(p-toluene sulfonyl thio) ethylamine hydrochloride IN-817 (H ₂ O)	50-100	50 25	-7 -2	10/10 10/10
1,3-Diphenyl-2-methylamine propane hydrochloride EL-11 (H ₂ O)	50-100	50	+4	10/10
1,2-Diphenyl-3-aminopropane hydrochloride EL-21 (H ₂ O)	50-100	50	0	10/10
N,N'-Dibenzylethylene diamine DO-53 (PG)	50-125	50 25	0 0	10/10 9/10
β,β,β -Triphenylethylamine hydrochloride EL-20 (H ₂ O)	150	50	-1	10/10
Aniline hydrochloride EK-442 (H ₂ O)	300-500	300 100	-1 0	9/10 10/10
m-Aminobenzotrifluoride MA-4 (PG)	50-100	50 25	-5 +3	10/10 10/10
3-Amino-4-chlorobenzotri-fluoride MA-13 (PG)	100	50 25	-3 +4	10/10 10/10
2,4,6-Tribromoaniline DO-43 (PG)	500-1,000	500 300	0 -1	10/10 10/10
p-Phenylenediamine EK-394 (H ₂ O)	50-100	50 25	+2 +1	10/10 10/10
2-Methylprocaine hydrochloride EL-15 (H ₂ O)	100-200	100	+3	10/10
Diphenylamine EK-105 (PG)	>1,000	1,000 200	-1 0	10/10 10/10
β -Naphthylamine CB-22 (PG)	200	100 50	+2 -5	10/10 10/10

(AMINES and IMINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
Diphenylamine sulfate EK-743 (PG and H ₂ O)	200-250		200 100	-3 -3	10/10 10/10
4,4'-Diamidinodiphenylamine dihydrochloride XR-37 (H ₂ O)	100		75 50	0 +3	10/10 10/10
Naphthionic acid M-5 (CMC)	300-400		300 200	-3 -1	10/10 10/10
Dibenzyline UCTL-6 (H ₂ O)	>20		2.0 1.25	-3 -2	9/10 10/10
N,N'-Diphenyl-p-phenylene diamine GY-2 (PG)	300-400		300 100	+2 +1	10/10 10/10
N,N'-Di-o-tolyl-p-phenylene diamine GY-1 (PG)	300-400		300 100	-1 +2	10/10 10/10
N,N'-Diphenylbenzidine EK-1797 (CMC)	>2,000		1,000 500	4 1	10/10 10/10
Azobenzene EK-704 (Oil)	500-1,000		500 200	+2 0	10/10 10/10
p-Aminoazobenzene EK-1375 (PG and H ₂ O)	200-300		200 160	+6 +2	9/10 9/10
N,N-Dimethyl-p-phenylazo-aniline EK-338 (CMC)	500-1,000		750 500 200	7 2 0	10/10 10/10 10/10
α -Benzyl α phenylhydrazine hydrochloride EK-1666 (H ₂ O)	300-500		300 100	0 6	10/10 10/10

NITRILES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Cyanamide EK-1995 (H ₂ O)	200-300	200 100	0 +2	9/10 10/10
Calcium cyanamide CY-2 (CMC)	100-200	100 25	-1 -2	10/10 10/10
Diethylcyanamide EK-6326 (PG)	50-100	50 20 10	-1 -3 +1	10/10 10/10 10/10
Thiocyanic acid (sodium salt) EK-T-434 (H ₂ O)	500-600	400 200	+7 +2	8/10 10/10
Ammonium thiocyanate EK-P-433 (H ₂ O)	500-1,000	400 200	+3 +3	10/10 10/10
Phenyl isothiocyanate M-4 (PG)	100	50 25	-2 +1	10/10 10/10
Acetonitrile EK-488 (H ₂ O)	500	400 200	+3 +2	10/10 10/10
Hydroxyacetonitrile A-8565 (H ₂ O)	10-25	10 7.5 5 2.5	-2 >20 0 +1	9/10 2/10 8/10 10/10
Chloroacetonitrile KF 5 (PG)	100-200	100 50	-4 +1	10/10 10/10
Azidoacetonitrile A-11014 (PG)	>25	25 10	0 0	10/10 10/10
Methylaminacetonitrile sulfate A-8104 (H ₂ O)	1,000	750 500	-3 +1	10/10 10/10
N-Methylene glycinnitrile DO-5 (PG)	200-300	200 100	+6 -1	10/10 10/10
3-Chloropropionitrile A-8798 (PG); DO-31 (H ₂ O)	100-200 (A-8798) 25-50 (DO-31)	100 50 25 10	-5 +3 0 0	10/10 10/10 10/10 9/10
3-Bromopropionitrile DO-51 (PG)	50-100	50 25	+2 +3	10/10 10/10
Ethylene cyanohydrin RH-7 (H ₂ O)	500-1,000	500 300	-1 -2	10/10 10/10

(NITRILES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
β -Aminopropionitrile A-8088 (H ₂ O)	>1,000		500 200	-1 -1	10/10 10/10
Cyanoacetic acid KF-17 (H ₂ O)	200-300		200 100	-7 +1	10/10 10/10
Methyl cyanoacetate KF-22 (PG)	200-300		200 100	0 +2	10/10 10/10
Ethyl cyanoacetate KF-25 (PG)	500-1,000		750 500	-1 -1	10/10 10/10
β -Ethoxy acrylonitrile KF-27 (PG)	100-200		100 50	+2 -4	10/10 10/10
Acetone cyanohydrin RH-8 (H ₂ O)	1-2		1 0.5	--1 -2	9/10 10/10
α -Methyl- α -nitropropionitrile A-13564 (PG)	10-15		10 5	-1 -1	10/10 10/10
4-Bromobutynitrile DO-6 (PG)	100-200		50 25	+5 -0	10/10 10/10
3-Pentanone cyanohydrin A-17195 (PG)	1-5		1 0.5	-2 -2	10/10 10/10
2-Methyl-2-(2-hydroxyethylamino)-propionitrile A-3961 (H ₂ O)	200-300		200 100	-5 -2	10/10 10/10
μ -(Bis-[2-chloroethylamino])-propionitrile UCTL-968 (H ₂ O)	10-20		10 5 1	-3 -5 -6	10/10 10/10 10/10
Ethyl acetamidocyanacetate CB-23 (H ₂ O)	>1,000		1,000 500	+2 -1	10/10 10/10
1-Ethoxy-1-(1-cyanoethoxy)-ethane A-10635 (H ₂ O)	1-6		1 0.5	-1 -1	10/10 10/10
2,2-Dimethyl-3-dimethylamino-propionaldehyde cyanohydrin A-4642 (PG)	10-25		10 5	-8 +1	10/10 10/10
1-Butoxy-1-(cyanemethoxy)-ethane A-10636 (PG)	1-5		1 0.5	-1 +1	10/10 10/10

(NITRILES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
1-Ethoxy-1-(1-cyano-2-butenyl-oxy)-ethane A-10637 (PG)	50-100	10 5	-4 0	10/10 10/10
Ethyl ethoxyethylidene cyano-acetate KF-6 (PG)	50-100	25 10	0 0	10/10 10/10
Malononitrile A-4600 (H ₂ O); KF-19	25	10 7.5 5 2.5	0 0 0 -1	10/10 10/10 6/10 10/10
Succinonitrile A-9442 (H ₂ O)	100-200	50 25	+3 0	10/10 10/10
Ethoxymethylene malononitrile A-9230 (PG); KF-10 (H ₂ O)	50-200	100 50 50 25	-9 +2 +4 0	10/10 8/10 8/10 10/10
Ethoxyethylidene malononitrile KF-8 (H ₂ O)	150-200	100 50	-4 -1	10/10 10/10
Ethoxypropylidene malononitrile KF-7 (PG)	50-100	50 25	0 +1	9/10 10/10
Bis-(2 cyanoethyl)amine A-8564 (H ₂ O)	200	100 50	-2 +1	10/10 10/10
β,β' -Thiodipropionitrile EK-P-6562 (PG and H ₂ O); HA-5 (PG)	500 EK-6562 300-400 HA-5	750 500 300 100	+4 0 -2 -1	10/10 10/10 10/10 10/10
Dithiodipropionitrile HA-6 (PG)	100-200	100 50	-3 -2	10/10 10/10
Trithiodipropionitrile HA-7 (PG)	50-100	50 25	-2 0	10/10 10/10
4-Acetyl-4-2(cyanoethyl)heptane dinitrile B-122 (PG)	500-1,000	500 200	+3 -3	10/10 10/10
α -Carbethoxy- μ,μ -bis-cyclo-propyl acrylonitrile A-15972 (PG)	100-200	200 100	-5 -6	10/10 10/10
2-Cyanocyclopentanone imine A-1967 (H ₂ O)	200-300	100 50	+1 -2	10/10 10/10

(NITRILES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
5-Methyl-5-cyano-2-pyrrolidone A-4641 (PG)	>1,000	1,000	-2	10/10
		750	0	8/10
		500	0	10/10
		250	0	9/10
Benzyl cyanide KF-21 (PG)	10-25	10	0	10/10
		5	3	10/10
Phenyl aceto-aceto nitrile PE-1 (PG)	200-300	200	-2	10/10
		50	+1	10/10
1-Cyano-1-phenyl-2-butanone EL-86 (PG)	100	50	+1	10/10
		25	+2	10/10
α -Carbethoxyphenylacetanilide A-5759 (PG)	25-50	20	-7	10/10
		10	0	10/10
p-Cyanobenzaldehyde KF-1 (PG)	100-200	100	-1	10/10
		50	+4	10/10
p-Methoxybenzaldehyde cyanohydrin A-13796 (PG)	25-50	20	+1	10/10
		10	0	10/10
α -Formyl-p-chlorophenyl neetonitrile EL-67 (PG)	50-100	50	0	10/10
		25	+2	10/10
β -(p-Methoxy phenoxy) propionitrile EL-68 (PG)	600-1,000	500	+3	10/10
		300	+3	10/10
α -p-Chlorophenyl neeto neetonitrile EL-43 (PG)	25	10	+1	10/10
		5	0	10/10
α -(2,4-Dichlorophenyl) α -cyano acetone aldehyde EL-31 (PG)	100-200	100	-3	10/10
		50	-2	10/10
Phthalonitrile ND-09 (PG)	25	10	-4	10/10
		5	-2	10/10
6-Chlorobenzylidene malononitrile KF-11 (PG)	50-100	50	-8	10/10
		25	-5	10/10
2-Cyanoacetyl coumarone KF-4 (PG)	100-200	100	-2	10/10
		50	-7	10/10
Phthalimidocoumarone A-903 (PG)	1,000	1000	-1	10/10
		100	-4	10/10

(NITRILES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
3-Indolacetonitrile CB-29 (PG and H ₂ O)	200-300	200 100	-2 1	10/10 9/10
1-Cyano-1'-hydroxy-cyclohexyl ether A-17933 (PG)	200-300	200 100	-2 -1	10/10 10/10
Diphenyl acetonitrile KF-13 (PG)	200-300	200 100	-2 -3	10/10 10/10
α - β -Diphenylacrylonitrile A-9789 (PG)	100-200	100 50	0 +1	10/10 10/10
α -(1-Piperidyl)- α -tolunitrile A-2217 (PG)	150-200	150 125 100 50	0 -4 -1 -1	8/10 10/10 10/10 10/10
α -(4-Morpholinyl)-p-tolunitrile A-3730 (PG)	200-300	200 100	0 -1	10/10 10/10
ϵ -Sulfanilamidocapronitrile hydrochloride A-5907 (PG)	500-1,000	750 500 200	-7 -7 +3	10/10 9/10 10/10
3-Cyano-8-methyl-10-chloro-acridine A-14718	200-300	200 100	-6 -5	10/10 10/10
3-Chloro-8-methoxy-10-cyano-acridine A-13396 (PG)	100-200	100 50	-1 0	10/10 10/10

HYDRAZINES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Benzylhydrazine hydrochloride EL-54 (H ₂ O)	50	25 10	+1 0	10/10 10/10
N-Methyl-N-benzyl hydrazine phosphate LA-17 (H ₂ O)	100-200	100 50	+1 -1	10/10 10/10
4-Methoxy-benzyl-hydrazine hydrochloride LA-7 (H ₂ O)	50-100	50 25	+2 -1	10/10 10/10
2-Phenyl-ethyl hydrazine dihydrochloride LA-10 (H ₂ O)	100	50 25	+3 +1	10/10 9/10
1-Cyclohexyl-2-hydrazino propane hydrochloride LA-4 (H ₂ O)	50-100	50 25	-2 +2	10/10 10/10
1-Hydrazino-2-phenyl propane phosphate LA-22 (H ₂ O)	100	50 25	+1 +1	9/10 10/10
1-Phenyl-1-hydrazino propane hydrochloride LA-11 (H ₂ O)	200-300	200 100	+1 -1	10/10 10/10
2-Phenyl-3-hydrazino butane hydrochloride LA-15 (H ₂ O)	100-200	100 50	+3 -1	10/10 10/10
N-Dimethyl-N'-(1-methyl-2-phenyl) ethyl hydrazine hydrochloride LA-13 (H ₂ O)	100	50 25	+1 -1	10/10 10/10
1-Phenyl-2-hydrazino-ethanol hydrochloride LA-12 (H ₂ O)	100-200	100 50	+3 -2	10/10 10/10
1-(2-Chloro)-phenyl-2-hydrazino propane hydrochloride LA-2 (H ₂ O)	100-200	100 50	-2 +3	10/10 10/10
[1-Methyl-2(4'-methoxy phenyl] ethyl hydrazine hydrochloride LA-18 (H ₂ O)	50-100	50 25	+3 0	9/10 10/10

(HYDRAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
1-(2'-Methyl) phenyl-2-hydrazino propane hydrochloride LA-6 (H ₂ O)	100	50 25	0 +2	10/10 10/10
1-(3'-Chloro)-phenyl-2-hydrazino propane phosphate LA-3 (H ₂ O)	100	50 25	0 0	10/10 10/10
2-(N-Methyl-N-benzyl) amino ethyl hydrazine dihydrochloride LA-21 (H ₂ O)	50-100	50 25	+2 +1	10/10 10/10
2-(N-Methyl-N-m-methoxybenzyl) aminoethyl hydrazine dihydrochloride LA-19 (H ₂ O)	100-200	100 50	+2 +1	10/10 10/10
N-(m-Chloro-benzyl)-N-methyl-aminoethyl hydrazine dihydrochloride LA-20 (H ₂ O)	100-200	100 50	+2 +1	10/10 10/10
2-(N-Methyl-N-p-chlorobenzyl) aminoethyl hydrazine dihydrochloride LA-14 (H ₂ O)	50-100	50 25	+2 +1	10/10 10/10
(1-Methyl-2-phenyl ethyl)-hydrazine methylene sulfonic acid LA-16 (PG)	50-100	50 25	+2 +1	10/10 10/10
1-Carbethoxy-2(4-hydroxy phenyl)-isopropyl hydrazine LA-5 (PG)	400-500	400 200	-1 +2	10/10 10/10
1-(3'4'5'-Trimethoxy-phenyl)-2-hydrazino-propane hydrochloride LA-8 (H ₂ O)	50-100	50 25	+1 0	10/10 10/10
3-Amino-4(p-chlorophenyl)-pyrazole EL-83 (PG)	100-200	100 50	+2 +2	10/10 10/10
N,N'-Bis-(1-phenyl)-isopropyl hydrazine hydrochloride LA-9 (PG)	200-300	200 100	-5 -7	10/10 10/10

OXACYCLOPENTANES and OXACYCLOHEXANES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
	Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Furfurylamine Q-1 (H ₂ O)	200	100 50	+1 +3	10/10 10/10
5-Nitro-2-furaldoxime EA-5 (PG)	100-200	100 50	+1 0	10/10 10/10
2,5-Bis(chloromercuri) furan UCTL-974 (H ₂ O)	20-40	10 7.5 5	-7 0 -4	10/10 10/10 10/10
5-Nitro-2-furaldehyde semi-carbazone EA-4 (PG)	200-300	200 100	0 0	10/10 10/10
5-Nitro-2-furaldehyde-2-(2-hydroxyethyl) semicarbazone EA-3 (PG)	200	100 50	+2 +1	10/10 10/10
Tetrahydrofurfurylamine Q-2 (H ₂ O)	200	100 50	+4 +3	10/10 10/10
Tetrahydrofurfural Q-4 (PG)	100-200	100 50	+3 -3	10/10 10/10
Methyl tetrahydrofuran Q-5 (H ₂ O)	>1,000	1,000 500	--2 --4	10/10 10/10
γ -Valerolactone Q-3 (H ₂ O)	>500	500 200	+1 0	10/10 10/10
5-Nitro-2-furaldehyde thio-semicarbazone EA-14 (PG)	50-100	25 10	0 +2	10/10 10/10
1-(5-Nitrofurylideneamino)-2-imidazolidenethione EA-7 (PG)	200-300	200 100	-1 -2	10/10 10/10
2-Amino-5-(5-nitro-2-furfuryl)-1,3,4-thiodiazole EA-11 (PG)	100-200	100 50	-2 0	8/10 10/10
1-(5-Nitrofurylideneamino)-2-thiohydantoin EA-13 (PG)	50-100	50 25	-7 0	7/10 10/10
N-(5-Nitro-2-furylidene)-3-amino-2-thioxazolidene EA-6 (PG)	>300	200 100	+1 -1	10/10 10/10

(OXACYCLOPENTANES and OXACYCLOHEXANES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
N-(5-Nitro-2-furfurylidene)-3-amino-5-methyl-2-thioxazolidone EA-8 (PG)	200-300	200 100	-5 -5	10/10 10/10
N-(5-Nitro-2-furfurylidene)-3-amino-2-oxazolidone (Furoxone) EA-1 (PG)	300	200 100	+2 -3	10/10 10/10
1-(5-Nitrofurfurylideneamino)-3-methyl-2-thiohydantoin EA-12 (PG)	100-200	100 50	-5 0	10/10 10/10
1-(2-Hydroxyethyl)-3-(5-nitrofurfurylideneamino)-2-imidazolidinethione EA-9 (PG)	100-200	100 50	-6 -1	10/10 10/10
1-Hydroxymethyl-3-(5-nitrofurfurylideneamino)-2-imidazolidinethione EA-10 (PG)	200-300	200 100	0 +3	10/10 9/10
N-(5-Nitro-2-furfurylidene)-1-aminohydantoin EA-2 (PG)	100-200	100 50	+3 +1	10/10 10/10
2-(2-Diethylaminoethylthiomethyl)-5-hydroxy-1,4-pyrone hydrochloride IN-14 (H ₂ O)	200-300	200 100	-1 +1	10/10 10/10
Melilotol (Dihydrocoumarin) DO-12 (PG)	200	100 50	+1 -1	10/10 10/10

THIACYCLOPENTANES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Thiophene EK-1860 (PG and H ₂ O)	100-200	100 50	+1 -3	10/10 10/10
dl-Homocysteine thiolactone hydrochloride B-10 (H ₂ O)	>1,000	1,000 750 500	0 +3 +4	10/10 8/10 10/10
N-Acetyl-dl-homocysteine thiolactone S-3 (H ₂ O)	>1,000	500 200 100	-2 -1 +3	10/10 10/10 10/10
Dibenzothiophene EK-4594 (CMC)	>1,000	1,000 500	-1 +5	10/10 10/10
Benzidine sulfone ND-67 (PG)	200	100 50	+1 -3	9/10 10/10
Diphenylthiophthalide B-41 (Cottonseed oil); CY-12	>2,000	1,000 500	+1 +1	10/10 10/10

AZACYCLOPENTANES and AZACYCLOHEXANES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Ethyl maleimide B-121 (H ₂ O)	25-50	10 1	-5 +1	10/10 10/10
2-(3-Pyrrolidinopropylamino)-4',5-dichloro-(1-diphenyl sulfide) monohydrochloride hemihydrate AB-31 (H ₂ O)	50-100	50	+1	10/10
		20	-3	10/10
		5	+4	10/10
2-(β -Pyrrolidinopropionamido)-4',4'-dichloro-(diphenyl sulfide) AB-27 (PG and H ₂ O)	>1,000	1,000	0	10/10
		750	+2	10/10
2-(3-Pyrrolidinopropionamido)-4',5-dichlorodiphenyl sulfide AB-29 (PG and H ₂ O)	200-300	200	+3	10/10
		100	-2	10/10
Indole-3-acetic acid CB-16 (H ₂ O and NaOH)	>1,000	750	-1	10/10
		500	-2	10/10
Carbazole EK-600 (PG)	200-300	200	+1	10/10
		100	+3	7/10
2-Triacetyl-nocholyl-octahydro pyrrozaoline UCTL-847 (PG)	50-100	75	-6	10/10
		50	-1	10/10
		10	+2	10/10
Picolinic acid UCTL-3 (H ₂ O)	>100	100	+2	16/16
		50	+1	16/16
		25	+1	16/16
Pyridine-3-sulfonic acid NR-2 (H ₂ O)	>750	750	-4	10/10
		500	-4	10/10
		100	2	10/10
		25	+4	10/10
Isonicotinic acid hydrazide (isoniazid) CB-2 (H ₂ O)	100-200	100	+1	10/10
		50	+2	10/10
3-Mercaptomethyl-4-oxymethyl-5-oxy-6-methyl-pyridine SC-1 (H ₂ O)	250-500	250	+4	10/10
		100	0	10/10
1-(4-Pyridyl)-2-nitropropanol XR-5 (PG and H ₂ O)	>400	300	0	10/10
		200	-1	10/10
		100	+2	10/10

(AZACYCLOPENTANES and AZACYCLOHEXANES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
N-(2-Pyridyl)cinnamamide hydrochloride IN-872 (PG)	100-200	100 50	+1 -1	8/10 10/10
N-(p-Nitrobenzyl)piperazine hydrochloride IN-821 (H ₂ O)	200-300	100 50	0 -1	10/10 10/10
N-(2-Pyridyl)- α -hydroxy-phenethyl amine hydrochloride IN-511 (H ₂ O)	500-1,000	250 100	0 +1	10/10 10/10
1-Isonicotinoyl-2-isopropyl-hydrazine phosphate (Iproniazide) B-120 (H ₂ O)	>300	200 100	0 +1	10/10 10/10
N-Phenyl-3-hydroxypyridinium chloride Q-8 (H ₂ O)	750-1,000	750 500	0 -3	10/10 10/10
N-Methyl-4-[2-(phenylthio)ethyl]-pyridine methobromide IN-5 (H ₂ O)	100	50 25	-1 -2	10/10 10/10
2-Methyl-3-hydroxy-4-hydroxymethyl-5-isothioureidomethyl-pyridine dihydrochloride SC-3 (H ₂ O)	300-500	300 100	0 +3	10/10 10/10
4-[2-(Benzylthio)ethyl] pyridine hydrochloride IN-4 (H ₂ O)	200-300	100 50	0 -2	10/10 10/10
4-[2-(Phenylthio)ethyl]-pyridine hydrochloride IN-3 (H ₂ O)	100-200	100 50	0 -1	10/10 10/10
4-[3-(Phenylthio)propyl]-pyridine hydrochloride IN-6 (H ₂ O)	100	50 25	-2 +2	10/10 10/10
4-(N-Methyl-3-indolylethyl)-pyridinium hydrochloride IN-399 (PG)	200-300	200 100	-4 -3	10/10 8/10
N-(3-Trimethylaminopropyl)-4-(N-methyl-3-indolylethyl)-pyridinium dibromide IN-391 (H ₂ O)	25-50	15 5	+1 -1	10/10 10/10

(AZACYCLOPENTANES and AZACYCLOHEXANES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Cinchoninic acid D-2 (H ₂ O)	200-300	200 100	+1 0	10/10 10/10
3-Carboxy-4-hydroxy-7-chloro-quinoline KF-16 (PG)	100-200	100 50	-7 -3	10/10 10/10
Hexadecane-1,16-bis-iso-quinolinium chloride XR-39 (H ₂ O)	10-20	5 2.5 1	-5 0 -4	10/10 10/10 10/10
6-Ethoxy-1,2-dihydro-2,2,4-trimethyl-quinoline B-24 (PG)	200-300	200 100	-6 +4	10/10 10/10
1,2-Dihydro-2,2,4-trimethyl-6-phenylquinoline B-29 (PG)	200	200 100	-4 +2	10/10 10/10
2-(3-Piperidinopropionamido)-4',5-dichloro-(1-diphenyl sulfide) AB-430 (PG and H ₂ O)	100-200	100 50	+5 +2	10/10 10/10
2-(3-Piperidinopropylamino)-4',5-dichlorodiphenyl sulfide monohydrochloride AB-432 (H ₂ O)	200-300	200 50 10	--4 -2 +4	10/10 10/10 10/10
2-(3-Piperidinopropionamido)-4,4'-dichlorodiphenyl sulfide AB-428 (PG and H ₂ O)	100-200	100 50 10	+2 +3 --2	10/10 10/10 9/10
2-(3-Piperidinopropylamino)-3,4-dichloro-(1-diphenyl sulfide) monohydrochloride hemihydrate AB-433 (H ₂ O)	200-300	200 50	-3 -4	10/10 10/10
5-Hydroxytryptophane CB-96 (H ₂ O)	200-400	300	+5	8/10
Serotonin creatinine sulfate CB-32 (H ₂ O)	>300	200 100 75 50 25	-5 -3 -2 -3	8/10 9/10 4/10 10/10 7/10
Adrenochrome UCTL-7 (H ₂ O)	100-200	150 100 50	-6 +1 0	10/10 7/10 10/10

(AZACYCLOPENTANES and AZACYCLOHEXANES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
Adrenosem salicylate V-1 (H ₂ O)	750-1,000	500 200	+1 +1	8/10 9/10
Methyl ergonovine maleate UCTL-8 (H ₂ O)	6	2	--2	10/10
3-Hydroxy-3-(4-chloro-3-sulfamylphenyl) phthalimidine (Hygroton) GE-3 (H ₂ O)	>500	500 200	--2 +2	10/10 10/10
Reserpine CB-27 (PG)	50-100	25 10	-3 0	10/10 10/10
D-Lysergic acid diethylamide SZ-2 (H ₂ O)	50-100	50 25	-5 -2	10/10 10/10
2-Brom-D-lysergic acid diethyl- amide SZ-1 (H ₂ O)	25-50	25 10	-2 0	10/10 10/10

OXAZOLES and OXAZINES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD_{50} in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST_{50} in days	Mortality at 30 days
3,4,5-Trimethylisoxazole CS-1340 (H_2O)	1,000	500 300	0 --4	10/10 10/10
5-Amino-4-(p-chloro-phenyl)-isoxazole EL-65 (PG)	200	100 50	+1 +1	10/10 10/10
Benzoxazole EK-5017 (PG and H_2O)	300-500	300 200	--2 +2	10/10 9/10
Benzoxazolone EK-5429 (CMC)	400-600	400 200	--4 +2	10/10 10/10
5-Chloro-3-(H)-2-benzoxazolone MA-10 (PG)	50-100	50 25	+3 +2	10/10 10/10
2-Benzoxazolethiol EK-5311 (CMC); XR-28 (H_2O and NaOH)	>200	200 150 150 100 100	--3 +13 +4 +1 +2	10/10 5/10 10/10 10/10 8/10
2-Methylbenzoxazole EK-982 (PG and H_2O)	400-500	300 100	--3 --1	10/10 10/10
2-Amino-5-chlorobenzoxazole MA-12 (PG)	100-200	100 50	+3 +1	10/10 10/10
2-(o-Hydroxyphenyl)-benzoxazole EK-6754 (Cottonseed oil)	2,000	1,000 500	0 --1	10/10 10/10
2,5-Diphenyloxazole EK-6775 (CMC)	750-1,000	750 500 200	-6 -3 0	10/10 10/10 10/10
3-Morpholinone DO-39 (H_2O)	>1,000	1,000 500	--2 --1	10/10 10/10
N,N-(3-Oxapentamethylene)-tert-butylthiosulfenamide B-27 (PG)	>2,000	500 200	+7 +8	8/10 9/10
Phenmetrazine hydrochloride (Preludin) GE-1 (H_2O)	50-100	50 25	--2 0	10/10 10/10

(OXAZOLES and OXAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
4,4'-Dithiodimorpholine EK-T-6645 B-17 (PG and H ₂ O)	50-100	50 25	—5 —2	10/10 9/10
1,4-Bis-(4-morpholinyl)-2-(phenylthio)-2-butene A-4890 (H ₂ O)	600-1,000	200 50	+2 —1	10/10 10/10

THIAZOLES and THIAMORPHOLINES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
Thiazolidine hydrochloride C-4 (H ₂ O)	>750		500 200	+1 +1	10/10 10/10
2-Thiazolidinethione EK-P-5444 (CMC)	>600		600 400	+1 +2	10/10 10/10
Thiazolidine-4-carboxylic acid C-1 (H ₂ O)	100-200		100 50	0 -1	10/10 10/10
2-Aminothiazole EK-P-5501 (PG)	200		100 50	-2 0	10/10 10/10
Pseudothiohydantoin BE-4-5 (PG); HA-9 (PG)	100-200 (BE-4-5) >1,000 (HA-9)		100 50 1,000 500	+3 0 -3 -3	10/10 10/10 10/10 10/10
Thiazoline-2-thiol A-10211 (PG)	300-500		300 100	+1 +1	10/10 10/10
Rhodanine HA-2 (PG)	200-300		100 50	+1 +1	9/10 10/10
2,4-Thiazolidinedione EK-5496 (H ₂ O)	400-600		400 200	+1 +3	10/10 10/10
2-Amino-4-methyl thiazole monoformate PD-15 (H ₂ O)	500		300 200	+2 -4	10/10 10/10
2-Amino-5-nitrothiazole EK-6561 (CMC)	200-300		200 100	+1 +2	10/10 10/10
2-Methyl thiazolidine-4-carboxylic acid hydrochloride C-5 (H ₂ O)	>750		500 200	0 0	10/10 10/10
2-Ethyl thiazolidine carboxylic acid C-2 (H ₂ O)	200-300		200 100	-2 0	10/10 10/10
Amino-tert-butyl thiazoyl sulfide B-36 (H ₂ O)	>1,000		1,000 200	0 +1	10/10 10/10
Pseudothiohydantoin DM-1 (PG)	100-200		100 50	-4 +2	10/10 10/10

(THIAZOLES and THIAMORPHOLINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
2-Amino-4-phenyl thiazole mono-hydrochloride PD-14 (H ₂ O)	200-300		100 50	-4 +1	10/10 10/10
N-Ethyl-N-thiazylaniline ND-65 (PG)	400-500		400 200	0 -2	10/10 10/10
2-Aminobenzothiazole XR-27 (H ₂ O and NaOH; EK-3940)	200		150 100 50	-4 -1 +3	10/10 10/10 10/10
2-Amino-6-methylbenzothiazole EK-5171 (CMC)	>100		100 75 50 25 10	+1 +5 +2 +4 +2	10/10 10/10 9/10 10/10 10/10
2,6-Diaminobenzothiazole A-7529 (PG)	>1,000		500 200	0 -1	10/10 10/10
2-Hydrazinobenzothiazole EK-3967 (PG)	100-200		100 50	-1 +2	9/10 10/10
Sulfathiazole SN-9 (PG)	400-500		400 200	0 -2	10/10 10/10
2-Amino-4-phenyl thiazole monohydrochloride PD-14 (H ₂ O)	200-300		100 50	-4 +1	10/10 10/10
2-Amino-4-(4-biphenylyl) thiazole EK-4373 (CMC)	150		100 50	+2 +3	10/10 10/10
Benzothiazole EK-4812 (PG and H ₂ O)	100-200		100 50	-2 0	10/10 10/10
2-Chlorobenzothiazole EK-2784 (PG and H ₂ O)	200-300		200 100 10	-3 -5 +1	10/10 10/10 9/10
2-Benzothiazolethiol (2-Mercaptobenzothiazole)	150-200 (XR-29)		150 100 400 200	+8 -2 -3 +5	10/10 10/10 10/10 6/10
XR-29 (H ₂ O and NaOH) EK-2638 (CMC)	>300 (EK 2638)		150 100 100	+7 +1 -3	10/10 10/10 10/10

(THIAZOLES and THIAMORPHOLINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
6-Amino-2-benzothiazolethiol XR-30 (H ₂ O and NaOH) EK-P-3994 (CMC)	150-200 >300	150		+3
		100		0
		200		+1
		200		-3
		100		-3
2-Mercapto-6-nitrobenzothiazole EK-3991 (CMC)	25-100	50		+2
		25		-3
2-Methylbenzothiazole EK-1853 (PG and H ₂ O)	300-500	200		-5
		100		0
5-Chloro-2-methylbenzothiazole EK-P-4382 (PG)	500	300		+2
		150		+1
2-Methyl mercaptobenzothiazole EK-4008 (PG and H ₂ O)	200-300	200		-2
		100		-2
		50		+3
2-Carbethoxymethyl thiobenzothiazole T-4 (PG)	200-300	200		-2
		100		-3
4,6-Dichloro-7-(β -diethylaminoethyl)-amino benzothiazole dihydrochloride DU-1 (H ₂ O)	100-200	100		+1
		25		0
N-Cyclohexyl-2-benzothiazolesulfenamide B-16 (CMC)	>2,500	1,000		-8
		500		-2
2,2'-Dithio-bis(benzothiazole) or Benzothiazyl disulfide (B-23, EK-5432) (CY-5)	100-200	1,000		-5
		500		0
		200		-2
		200		-1
		150		+7
		100		+1
		100		-1
				10/10
Thiazane carboxylic acid hydrochloride C-3 (H ₂ O)	>750	500		-6
		200		+1
N,N-Dimethylthiomorpholinium iodide A-5200 (H ₂ O)	100	50		+3
		20		+1
4,5-Dimethyl-6-phenyl-3-thiamorpholinone PD-41 (PG)	200-300	200		+1
		100		-4

(THIAZOLES and THIAMORPHOLINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
3,6-Bis[2-(4-thiomorpholinyl)-ethyl]-2,5-piperazine dione A-5205 (CMC)	>2,000		500	+4	10/10
Phenothiazine-5-oxide DO-58 (PG); DO-16 (PG)	>1,000 (DO-58) 100-200 (DO-16)	750 500 100 50		+2 +1 -1 -2	10/10 10/10 10/10 10/10
3-Ethochloride of 9-dimethyl-amine 3-isophenothiazine ND-66 (PG)	50-100		100 50	-4 -4	10/10 10/10
10-(α -Methyl- α -diethyl aminoethyl)-phenothiazine XR-9 (PG)	100-150		100 75 50	+1 0 0	10/10 10/10 10/10
10-(β -Dimethylaminopropionyl)-phenothiazine XR-6 (H ₂ O)	50-100		75 50	-1 +2	10/10 10/10
10-(β -Diethylaminopropionyl)-phenothiazine XR-7 (PG)	125-150		100 75 50	+1 +2 +1	10/10 10/10 10/10
10-(Pyrrolidinoacetyl)-phenothiazine XR-26 (PG)	150-200		150 100	+2 -3	10/10 10/10
10-(α -Pyrrolidinopropionyl)-phenothiazine XR-8 (PG)	125-150		125 100 50	-4 +5 +2	10/10 10/10 10/10
2-Methylmercapto-10[2-(N-methyl-2-piperidyl)ethyl] phenothiazine hydrochloride (Mellaril) SZ-3 (H ₂ O)	100-200		100 50	-5 +3	10/10 10/10
Thioethyl-3-[{(methyl-4'-piperazinyl)-3'-propyl]-10-phenothiazine dimaleinate SZ-4 (H ₂ O)	100-200		100 50	-3 +2	10/10 10/10

DIAZOLES and DIAZINES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD_{50} in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST_{50} in days	Mortality at 30 days
4-Aminopyrazole hydrochloride EL-53 (H_2O)	300-500	300 100	-4 +1	10/10 10/10
3-Chloro-4-aminopyrazole hydrochloride EL-46 (H_2O)	200-300	200 100	0 0	10/10 10/10
3-Amino-4-cyano-5-ethyl pyrazole EL-35 (H_2O)	500-1,000	500 300	-2 -1	10/10 10/10
3-Amino-4-phenyl pyrazole EL-34 (H_2O)	200-300	200 100	0 +1	10/10 10/10
1,3,4-Thiadiazole-2,5-dithiol A-8354 (PG)	200	100 50	0 +1	10/10 10/10
2-Amino-5-methyl-1,3,4-thiadiazole CY-3 (PG)	400-500	400 200	-2 +2	10/10 10/10
9-(β -Chlorethyl) carbazole UCTL-188 (PG)	50-100	75 50 10 2	-2 -2 -3 +5	10/10 10/10 10/10 10/10
2-Benzimidazolethiol XR-21 (H_2O and NaOH) EK-6540	200	150 100	0 +2	10/10 10/10
5-Amino-2-benzimidazolethiol EK-5133 (CMC)	>300	400 200	-2 0	10/10 10/10
2-Aminobenzimidazole EK-4037 (PG)	100-200	100 50	0 +2	10/10 10/10
2(2'-Dimethyl aminoethyl mercapto) benzimidazole dihydrochloride EL-56 (H_2O)	200	100 50	+1 0	9/10 10/10
2-[3(Dimethylamino)propylthio]-benzimidazole IN-8 (H_2O)	50-100	50 25	-1 1	10/10 10/10
Imidazole EK-4733 (H_2O)	300-500	300 100	+2 0	10/10 10/10
2-Mercaptoimidazole EL-57 (H_2O and $NaHCO_3$)	200-300	200 100	0 -1	10/10 10/10

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
2-Mercaptoimidazoline EL-62 (H ₂ O and NaHCO ₃)	200-300	200 100	+1 0	10/10 10/10
2-Imidazolidinethione EK-P-5950 (PG and H ₂ O)	>2,000	1,000 500	-5 +1	10/10 10/10
Hydantoin DO-66 (H ₂ O)	>1,000	1,000 500	+1 -3	10/10 10/10
2-Thiohydantoin BE-25 (PG)	100-200	100 50	-1 0	10/10 10/10
2-Mercapto-4-imidazole carboxylic acid EL-98 (H ₂ O and NaHCO ₃)	>1,000	750 500	0 +1	10/10 10/10
1-Acetyl-2-thiohydantoin B-7 (PG and H ₂ O)	750-1,000	500 200	0 +4	10/10 10/10
BE-0405 (PG)	200-300	200 100	+2 0	10/10 10/10
1-Methyl-2-mercaptopimidazole EL-30 (H ₂ O)	500-1,000	750 500	+5 -2	10/10 10/10
1-Methyl-2-mercaptop-5-imidazole carboxylic acid EL-97 (H ₂ O and NaHCO ₃)	200-300	200 100	0 +3	10/10 10/10
1-n-Butyl-2-mercaptopimidazole EL-64 (H ₂ O and NaHCO ₃)	200-300	200 100	-4 -2	10/10 10/10
1-sec-Butyl-2-mercaptopimidazole EL-59 (PG)	100-200	100 50	-1 +2	10/10 10/10
1-Isobutyl-2-mercaptopimidazole EL-66 (PG)	200-250	200 100	-2 -1	10/10 10/10
2-Mercapto-5-carbethoxy-imidazole EL-63 (H ₂ O and NaHCO ₃)	300-500	300 200	+2 +1	10/10 10/10
Histamine diphosphate B-132 (H ₂ O)	>500	500 300	+1 +2	10/10 10/10
L-Thiohistidine B-1 (H ₂ O)	1,000-1,500	1,000 500	+2 3	10/10 10/10

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
1-(Dimethylaminoethyl)-2-mercaptop imidazole hydrochloride EL-55 (H ₂ O)	300-500	300 200	0 +2	10/10 10/10
2-(Carboxy methyl thio)-2-imidazoline chloroacetate PD-5 (H ₂ O)	200-300	200 100	-3 +1	10/10 10/10
2-(3-Aminopropyl thio)-2-imidazoline dihydrom bromide PD-4 (H ₂ O)	200-300	100 50	-1 0	10/10 10/10
1,3-Ethylene-2-(3-trimethyl-amino)-propylisothiuronium dibromide IN-9 (H ₂ O)	25-50	25 15	-5 +1	10/10 10/10
1-Isopropyl-2-(2-mercaptopethyl-amino)-4,4-dimethylimidazolinium sulfate B-127 (H ₂ O)	>1,000	1,000 500	-2 -2	10/10 10/10
1-Isopropyl-4,4-dimethyl-imidazolidine CS-1751 (H ₂ O)	300-500	300 200	+2 -2	10/10 10/10
1-Ergothioneine hydrochloride B-26 (H ₂ O)	500-1,000	500 200	-6 +6	10/10 10/10
1-[2[(4,5-Dihydroimidazolyl)]-ethyl-3-2[1-imidazolyl] ethyl-2-thiourea A-6231 (PG)		500 400 200 100	-1 0 +1 -4	10/10 10/10 8/10 10/10
Kesco x-169 (high M.W. imidazoline) KE-6 (PG)	50-100	50 25	-5 -1	10/10 10/10
1-Cyclohexyl-2-mercaptop-imidazole EL-58 (PG)	100-200	100 50	+2 0	10/10 10/10
1-Phenyl-4,4-dimethylimidazolidine CS-1752 (PG)	100-200	100 50	-3 -3	7/10 10/10
1-Phenylethyl-2-mercaptop-imidazole EL-60 (PG)	100-200	100 50	+1 -2	10/10 10/10

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
1-(2'-Pyridyl)-2-mercapto-imidazole dihydrochloride EL-61 (PG)	500-1,000	400 200	-1 -2	10/10 10/10
1-Benzoyl-2-thiohydantoin B-14, EK-3881 (PG and H ₂ O)	200-400	200 100	+2 -3	9/10 10/10
Pyrimidine CB-15 (PG)	>1,000	1,000 500	0 0	10/10 10/10
Uracil CB-4 (H ₂ O)	>1,000	1,000 500	+1 0	10/10 10/10
2-Aminopyrimidine CB-6 (H ₂ O)	>1,000	1,000 500	+2 +2	10/10 10/10
2-Amino-4-carboxy-5-chloro-pyrimidine CB-12 (PG)	>300	200 100	+1 -3	10/10 10/10
2-Amino-4-methyl pyrimidine UCTL-2 (H ₂ O)	>400	400 200 100 50	+3 0 0 -4	14/16 16/16 16/16 16/16
2,4-Dihydroxy-6-amino pyrimidine KF-12 (PG)	200-300	200 100	-2 -1	10/10 10/10
4-Oxy-6-diethoxy-3-methyl-pyrimidine XR-4 (PG and H ₂ O)	>200	300 200 100	+1 0 0	10/10 10/10 10/10
Thymine S-2 (H ₂ O)	>1,000	1,000 400	0 -1	10/10 10/10
5-Methyl-5-β-isothioureido-ethyl barbituric acid hydrobromide EL-87 (H ₂ O)	750-1,000	500 200	-1 +2	10/10 10/10
2-Thiobarbituric acid EK-660 (CMC)	600-1,000	400 200	+1 -2	10/10 10/10
2-Amino-4-methyl-5-iodo-6-pyrimidinethiol EL-25 (PG and H ₂ O)	300-400	300 100	+1 +3	10/10 10/10
2,4-Dithiopyrimidine CB-14 (PG)	250-500	100 50	+4 -1	8/10 10/10

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
6-Methyl-2-thiouracil EK-6454 (PG)	200	500 100	0 0	9/10 10/10
2-Thio-4-methyl-6-oxyprymidine (Na Salt) EL-100 (H ₂ O)	500	300 200	+2 -1	10/10 10/10
5-Carbethoxythiouracil XR-1 (H ₂ O)	>200	150 100	+2 +4	10/10 10/10
2-Mercapto-4-oxy-6-diethoxy- 3-methyl pyrimidine XR-3 (PG and H ₂ O)	>200	300 200 100	-1 -2 +1	10/10 10/10 10/10
2-Thio-4,4,6-trimethyl dihydro- pyrimidine K-1795 (PG)	100-200	100 50	-3 +3	10/10 10/10
2-Thio-1,4,4,6-tetramethyl dihydropyrimidine K-1338 (PG)	200	100 50	-1 -1	10/10 10/10
1-β-Hydroxyethyl-2-thio- 4,4,6-trimethyl dihydro- pyrimidine K-1797 (PG)	200-300	200 100	+3 -1	10/10 10/10
2-Ethylmercapto-4-oxy-6-diethoxy- 3-methyl pyrimidine XR-2 (PG and H ₂ O)	>400	300 200 100	-4 +1 +2	10/10 10/10 10/10
1-(n-Butyl)-2-thio-4,4,6-tri- methyl dihydropyrimidine K-1339 (PG)	100-200	100 50	+2 -1	10/10 10/10
2-(Acetamido-tert-butyl)- 6-propyl-isothiouracil B-50 (PG)	200	100 50	0 +1	10/10 10/10
5-Allyl-5-(1-methylbutyl)-4-imino- 2-thiobarbituric acid (Na salt) EL-22 (H ₂ O)	300-500	300 100 50	-7 -3 +4	10/10 10/10 10/10
2-Thio-4-methyl-α-(γ-diethyl- aminopropyl)-6-oxy-prymidine EL-2 (PG and H ₂ O)	500-1,000	300 100	-1 +1	10/10 10/10

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	
4-Amino-6-oxyurimidine-2-thioglycolic acid EL-10 (H ₂ O)	20-30	25 5		-1 +1	10/10 10/10
2-Mercapto-4-amino-5-carbethoxy-pyrimidine El-24 (PG and H ₂ O)	>1,000		600 100	-1 +2	10/10 10/10
1-Butyl-3,4,5,6-tetrahydro-2-pyrimidinethione PD-1 (PG)	100-200		100 50	-1 0	10/10 10/10
Thiamine hydrochloride CB-20 (H ₂ O)	200		100 50	0 0	10/10 10/10
p-Mercapto sulfadiazine (TSD) I.O-3 (PG)	100		50 25	-1 +2	10/10 10/10
1-(Cyclohexyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1861 (PG)	100-200		100 50	-2 0	10/10 10/10
1-Phenyl-2-thio-4,4,6-trimethyl dihydropyrimidine K-1796 (PG)	200		100 50	0 -1	10/10 10/10
1-(2-Hydroxyphenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1344 (PG)	200-300		200 100	+3 -1	10/10 10/10
1-(m-Hydroxyphenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1345 (PG)	100-200		100 50	+1 -1	10/10 10/10
1-(4-Hydroxyphenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1346 (PG)	200-300		200 100	-3 +1	10/10 10/10
1-(2-Nitrophenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1351 (PG)	200-400		200 100	-1 -1	10/10 8/10
1-(3-Nitrophenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1352 (PG)	200-300		200 100	+1 +2	9/10 10/10

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
1-(m-Tolyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1341 (PG)	200-400	200		0
		100		+4
		50		+1
1-(o-Tolyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1340 (PG)	200		100	-3
			50	--2
1-(2-Chlorophenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1347 (PG)	100-200		100	-1
			50	+3
1-(3-Chlorophenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1348 (PG)	200-300		200	-2
			100	-1
1-(p-Chlorophenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1349 (PG)	200		100	-1
			50	+1
1-(p-Sulfophenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-2598 (PG)	200-300		200	-1
			100	-2
1-(3-Sulfophenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1563 (PG)	50-100		50	3
			25	-1
1-(2-Sulfo-4-methylphenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-2600 (PG)	200-300		200	0
			100	+2
1-[p-(Dimethyl amino)phenyl]-2-thio-4,4,6-trimethyl dihydropyrimidine K-1355 (PG)	200		100	2
			50	-1
1-(2,5-Dichlorophenyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1350 (PG)	100-200		100	2
			50	0

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
m-Phenylene-bis-1,1'-(2-thio-4,4,6-trimethyl dihydro-pyrimidine) K-1359 (PG)	100-200	100 50	+2 -5	10/10 10/10
p,p'-Diphenylene bis-1,1'-(2-thio-4,4,6-trimethyl dihydropyrimidine) K-1358 (PG)	100-200	100 50	-1 -1	10/10 10/10
1-Methyl-2,4-phenylene bis-1,1'-(2-thio-4,4,6-trimethyl dihydropyrimidine) K-1360 (PG)	100-200	100 50	+4 0	10/10 10/10
1-[p-(Phenylazo)phenyl]-2-thio-4,4,6-trimethyl dihydro-pyrimidine K-1354 (PG)	200-300	200 100	-2 0	10/10 10/10
1-(o-Bicyclohexyl)-2-thio-4,4,6-trimethyl dihydro-pyrimidine K-1562 (PG)	100-200	100 50	-2 0	10/10 10/10
1-(α -Naphthyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1356 (PG)	300-400	300 100	-1 -1	10/10 10/10
1-(β -Naphthyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-1357 (PG)	400-500	200 100	+2 0	9/10 9/10
1-(6-Sulfo-1-naphthyl)-2-thio-4,4,6-trimethyl dihydro-pyrimidine K-1565 (PG)	100-200	100 50	-1 +2	10/10 10/10
1-(1-Sulfo-2-naphthyl)-2-thio-4,4,6-trimethyl dihydro-pyrimidine K-2601 (PG)	200-500	100 50	0 -1	10/10 9/10
1-(4,8-Disulfo-1-naphthyl)-2-thio-4,4,6-trimethyl dihydropyrimidine K-2602 (PG)	200-300	200 100	+2 -3	10/10 10/10

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD ₅₀ in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
1-[2-(6,8-Disulfonaphthalyl)]-2-thio-4,4,6-trimethyl dihydropyrimidine K-1566 (PG)	200-300	200 100	-1 -3	10/10 10/10
Adenine CB-18 (PG)	100-200	100 50	-1 0	10/10 10/10
Xanthine CB-17 (H ₂ O)	500-1,000	500 200	+1 0	10/10 10/10
8-Aza-2-thioxanthine CB-25 (PG)	200-300	200 100	+1 -1	10/10 10/10
8-Azaxanthine (2,6-Dioxy-8-azapurine) CB-26 (PG)	200-300	200 100	+1 0	10/10 10/10
8-Chloroxanthine UCTL-1 (H ₂ O)	>400	400 200 100 50	+5 +6 +5 +4	16/16 16/16 16/16 16/16
Folic acid CB-13 (H ₂ O and NaHCO ₃)	100-200	100 50	--3 --1	10/10 10/10
Adenylic acid CB-8 (H ₂ O)	>1,000	1,000 500	-2 +1	10/10 10/10
Adenosine CB-10 (PG and H ₂ O)	500-1,000	500 200	+1 +2	10/10 10/10
Guanosine CB-11 (PG and H ₂ O)	500-1,000	500 200	+1 0	10/10 10/10
Piperazine hexahydrate A-3803 (H ₂ O)	300-400	300 200	-9 +1	10/10 10/10
1,4-Dinitropiperazine DO-36 (PG)	100-200	100 50	-4 -5	10/10 10/10
N-(2-Aminoethyl)piperazine DO-46 (PG)	250-500	250 100	--7 -1	10/10 10/10
1-Piperazine ethanol DO-22 (PG)	100-200	100 50	-3 -1	10/10 10/10

(DIAZOLES and DIAZINES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies			
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days	Mortality at 30 days
N,N'-Dioxide of 1,4-diazabicyclo-(2.2.2) octane HO-1 (H ₂ O)	>1,000		1,000 500	0 +3	10/10 10/10
1,4-Bis-(2,3-ethoxypropyl)-piperazine EL-26 (H ₂ O)	► 75-125		70 50	-6 -1	10/10 10/10
Tetradecane-1, 4-bis-isoquinolinium methosulfate XR-38 (H ₂ O)	10		10 5	+1 0	10/10 10/10
2-Hydroxy-3-methyl quinoxaline EL-7 (PG)	30-50		25 10	+4 -5	10/10 10/10
2,3-Dihydroxyquinoxaline EK-6232 (CMC)	200		100 50	-4 +2	10/10 10/10

TRIAZOLES and DIOXANES

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity Approx. LD_{50} in mg./kg.	Radiation studies		
		Dose mg./kg.	Change in ST_{50} in days	Mortality at 30 days
3-Amino-1,2,4-triazole XR-22 (H_2O)	200	150 100	+1 0	10/10 10/10
4-Ketobenzotriazine MA-2 (PG)	50-100	50 25	-2 +1	10/10 10/10
6-Azauracil CB-30 (PG)	200-300	200 100	+1 0	10/10 10/10
6-Methyl-1,2,4-triazine-3,5-dione (6-azathymine) CB-28 (PG)	200-300	200 100	+3 0	10/10 10/10
4,6-Diamino-1,3,5-triazine-2-thione B-47 (PG)	500	300 100 50	-4 +1 +5	10/10 10/10 10/10
Dithioammelide B-42 (Cottonseed oil); CY-11	>2,000	500 200 100	-1 -2 +4	10/10 10/10 10/10
Thiomimeline B-45 (PG); CY-14	200	100 50	+2 -2	10/10 10/10
5-Amino-1,2,4-triazine-3-thiol A-6338 (PG)	100-200	100 50	-2 -2	10/10 10/10
Benzoguanamine RH-5 (PG)	100-200	100 50	+3 +2	10/10 10/10
1,3,5-Triazine 2,4,6 trimercaptan (Trithiocyanuric acid) TH-3 (H_2O and $NaHCO_3$)	200-300	200 100	-4 0	10/10 10/10
Alkylated 2-hydroxyphenyl benzotriazole (Timuvin P-661) GE-2 (PG)	>1,000	500 200	-6 -7	10/10 10/10
Dihydroxyacetone (1,3-dihydroxy-2-propanone) WA-1 (H_2O)	>1,000	1,000 500	-3 0	10/10 10/10
Phenothiazin DO-17 (PG)	200	100 50	-2 0	10/10 10/10

(TRIAZOLES and DIOXANES)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
p-Oxathiane-4,4-dioxide DO-38 (PG)	200		100 50	0 +1
2-Aminomethyl benzodioxane hydrochloride EL-48 (H ₂ O)	200-300		150 100	+1 +1
2-Butylaminomethyl benzodioxane hydrochloride EL-38 (H ₂ O)	100		50 25	+1 +2
2-Butylaminomethyl-8-ethoxy benzodioxane EL-32 (H ₂ O)	100-200		100 50	+3 0
5-Chloro-8-ethoxy-2-butyl aminomethyl benzodioxane hydrochloride EL-51 (H ₂ O)	100-200		100 25	+2 +1

MISCELLANEOUS

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Benzotrifluoride MA-16 (PG)	100-200	100 50	-1 0	10/10 10/10
m-Nitrobenzotrifluoride MA-5 (PG)	100-200	100 50	-5 +1	10/10 10/10
3-Chloro-1-iodopropyne DO-18 (PG)	25	10 5	-2 -2	10/10 10/10
Ethylene di bunte salt TH-13 (H ₂ O)	>1,000	1,000 500	-1 +1	10/10 10/10
Benzyl bunte salt TH-15 (H ₂ O)	>1,000	500 300	+2 +2	10/10 10/10
Ether di bunte salt TH-14 (H ₂ O)	>1,000	1,000 500	-2 -1	10/10 10/10
2-Ethylhexene-1 DO-21 (PG)	100	50 25	-1 -3	10/10 10/10
Sodium hydroxy-x-propane sulfonate DO-33 (H ₂ O)	>1,000	1,000 500	2 0	10/10 10/10
α-dl-Methadol EL-33 (H ₂ O)	100-200	50 25	+1 -1	10/10 10/10
Hesperidin CP-3 (H ₂ O)	1,000	500 200	0 0	10/10 10/10
Sulphocol sol. MU-1 (H ₂ O)	>150	150 100	0 -1	10/10 10/10
Cytidylic acid NB-3 (H ₂ O)	>1,000	500	0	10/10
Anthracene EK-480 (Cottonseed oil)	>2,000	1,000 500	-1 +1	10/10 10/10
Lomidine isoethionate XR-10 (H ₂ O)	100-150	75 50 20	-3 -1 +2	10/10 10/10 10/10

(MISCELLANEOUS)

Compound, USAF number, and vehicle used for toxicity and radiation tests	Toxicity	Radiation studies		
		Approx. LD ₅₀ in mg./kg.	Dose mg./kg.	Change in ST ₅₀ in days
Antioxidant G-15 G-7 (PG)	100-200	200 100	0 --1	10/10 10/10
Antioxidant G-16 G-8 (PG)	300-400	300 100	--3 --1	10/10 10/10
Neomycin sulfate CB-19 (H ₂ O)	300-500	200 100	+3 --2	10/10 10/10
Bacitracin CB-7 (H ₂ O)	300-400	300 100	--4 +3	10/10 10/10
Griseofulvin SC-2 (PG)	200	100 50	+2 +6	10/10 10/10
Anhydroerythromycin-N-oxide EL-99 (PG)	200-300	200 100	--1 --1	10/10 9/10
Parathyridin EL-27	>50 Units	0.5 c.c.	--4	10/10
Protamine sulfate D-4	100-200	100 50	-4 1	10/10 10/10
Nucleic acid (yeast) CB-1	>1,000	1,000 500	-2 +3	10/10 10/10
Uvinul P-49 U-49	>1,000	1,000 500	-2 +4	10/10 9/10
Uvinul M-40 U-40	>1,000	1,000 750	-2 5	10/10 10/10

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4-Oxy-6-diethoxy-3-methylpyrimidine	90
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Parathyridin	100
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4-[3(Phenylthio) propyl] pyridine hydrochloride	78
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